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ABSTRACT

Under a 1972 grant from the National Science Foundation's College Science Improvement Program (CoSIP), Worcester Polytechnic Institute (WPI) undertook a major educational experiment involving the total reorientation of its educational programs. The encompassing effort is referred to as the WPI PLAN. A major facet of the WPI PLAN involves student project work in off-campus settings, with an emphasis on independent study of real-life problems involving the interaction of technology with society. This manual describes the development and operation of one of WPI's off-campus educational project centers for such activities located in Washington, D.C. The operation of the center, including the definition of program objectives and the program's development, implementation, and evaluation, are presented. Guidelines are indicated for financing an off-campus center. As the concept of the off-campus educational center is considered transferable to other institutions, this guide is intended to facilitate the adoption of those elements of the WPI center applicable to the majority of postsecondary institutions. (BT)

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A GUIDE TO OFF-CAMPUS STUDENT PROJECT CENTER OPERATIONS

Project Report No. 2

Report prepared for
NATIONAL SCIENCE FOUNDATION
DIRECTORATE FOR SCIENCE EDUCATION
Restructuring the Undergraduate Learning Environment
Under Grant Number GY-9353

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A GUIDE TO OFF-CAMPUS STUDENT PROJECT CENTER OPERATIONS

A Manual Based Upon the Model Project Center of Worcester Polytechnic Institute Worcester, Massachusetts

Project Report No. 2

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December 1975

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ABSTRACT

During the 1974-75 Academic Year, Worcester Polytechnic Institute opened an off-campus, educational project center in Washington, D.C.

An on-site director, supported by an on-campus administrator, and assisted by four other faculty members, staffed the center during its first year of operation. Sixty-six undergraduate students completed educational projects for academic credit, in cooperation with fourteen Washington-based organizations.

The operation of the center, including the definition of program objectives, and the program's development, implementation, and follow-up are presented. Guidelines are indicated for financing an off-campus center.

As the concept of an off-campus educational center is highly transferable to other institutions, this guide is intended to facilitate the adoption of those elements of the WPI center applicable to the majority of postsecondary institutions.

FOREWORD

The National Science Foundation's Directorate for Science Education through its program, Restructuring the Undergraduate Learning Environment (RULE), is supporting a limited number of projects at institutions that are undertaking major changes in their undergraduate instructional programs in the sciences. In May 1972, Grant GY-9353, the prototpye award for this program, was made to Worcester Polytechnic Institute, Worcester, Massachusetts. The purpose of this document is to transmit to the public one of the products of that project.

The Foundation's purpose in RULE is to encourage colleges and universities and their science faculties in the development, testing, and evaluation of new or unconventional approaches to the organization, management, delivery, and/or content of undergraduate science education. Awards under RULE for projects which are comprehensive or institutional in scope, are based on the presumption that some of the problems confronting institutions of higher learning require a systematic, rather than fragmented approach. Projects which are directed at altering the basic structures of science programs and which are determined to have the greatest potential for increasing nationally the diversity of institutional settings for science receive priority in consideration for support.

The objectives of the Worcester Polytechnic Institute's restructuring project, for which NSF and other agencies both public and private have provided support, are summarized by the institution in its original proposal as follows:

> Worcester Polytechnic Institute following two and one half years of intensive study and planning, has developed and begun the implementation of a PLAN for a new and comprehensively different educational program, responsive to the needs of individual students, responsive to the needs of society, and encouraging sensitivity to the ideas and values of civilization. The PLAN involves a complete change in every aspect of campus activities, affecting every member of the faculty, every student, and every administrator.
>
> Since this major educational enterprise, involving total reorientation of an entire college, will require significant investment over the next several years, WPI now requests the assistance of the National Science Foundation and the National Endowment for Humanities, in developing itself as a model college, featuring: 1. Degree requirements measuring the achievement of competence rather than accumulation of academic credits. 2. Individual freedom in the planning of the educational process rather than a rigid prescribed curriculum. 3. A large component of self-initiated investigation rather than passive classroom participation. 4. New instructional methods emphasizing education as a cooperative venture between students and faculty, rather than the more frequent relationship of mutual antagonism.

> The PLAN emphasizes programs with concentration in science or engineering, containing a unique prescription for the integration of the humanities into the total educational experience, and programs with concentration in humanities or social science requiring demonstration of significant competence in science and engineering.
>
> WPI is now totally committed to an innovative model program which will not only demonstrate the educational effectiveness and financial feasibility of a new approach to scientific, technological and humanistic education, but will also add to the national experience in methodology of affecting major reform in established institutions of higher learning.

The Foundation's intentions in awarding this grant were to assist WPI in implementing its plan for total restructuring of its undergraduate program in the sciences, to help insure that the resultant project could be observed and studied as a model, and to provide to all interested parties some insight into the process of institutional change.

A major facet of the WPI PLAN involves student project work in off-campus settings, with an emphasis on independent study of real-life problems involving the interaction of technology with society. This manual describes the development and operation of one of WPI's centers for such activities, located in Washington, D.C. It is my belief that this document may serve as a significant resource to persons concerned with the Nation's higher education, in particular undergraduate science education.

Robert F. Watson
Coordinator
Educational Program Restructuring
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PREFACE

This manual was prepared by those members of the WPI community who were directly responsible for the first year of operation of the Washington D.C. Project Center:

Prof. Francis C. Lutz, Center Director
Mr. Joseph J. Mielinski, Projects Adminitrator
Prof. James S. Demetry, Director of the Division of Interdisciplinary Affairs, and Department of Electrical Engineering
Prof. Allen H. Hoffman, Department of Mechanical Engineering
Prof. Carlton W. Staples, Department of Mechanical Engineering
Prof. Stanley D. Weinrich, Department of Chemical Engineering
Prof. William R. Grogan, Dean of Undergraduate Studies

During this period, the operation of the center was assisted by the College Science Improvement Programs of the National Science Foundation, the Alfred P. Sloane Foundation, the Polaroid Corporation, and the National Institute of Education in the U. S. Department of Health, Education and Welfare.

The preparation of this document was funded by the National Science Foundation's Restructuring Undergraduate Learning Experiences Division.

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I. INTRODUCTION

Orientation

Under a 1972 grant from the National Science Foundation's College Science Improvement Programs (CoSIP), Worcester Polytechnic Institute, a privately endowed college of science and engineering focusing mainly on undergraduate education, undertook a major educational experiment involving the total reorientation of its educational programs. The encompassing effort is referred to as the WPI PLAN.

Because one of the prime objectives of this reorientation was the development of a student project structure that would provide the opportunity for new learning experiences, several off-campus project centers were established. Among these is the Washington D.C. Project Center, opened in September of 1974. Due to its uniqueness as Worcester Polytechnic Institute's only resident center, its demonstrated potential for high quality undergraduate learning, and its potential for reproduciability by other colleges, the planning for, and operation of, the Washington D.C. Project Center is documented in this manual.

A brief description of Worcester Polytechnic Institute's educational program is presented to acquaint the reader with the overall context in which the center operates. It should be noted, however, that the concepts implemented through the Washington Center are applicable by a variety of postsecondary institutions whose educational programs greatly differ from those of Worcester Polytechnic Institute.

The WPI PLAN

Since the original NSF CoSIP award of $733,000 in 1972, Worcester Polytechnic Institute has been redirecting its undergraduate science and engineering programs toward a direct responsiveness both to the needs of the individual student and to the needs of society.

Perhaps the most important aspect of the PLAN is the granting to the student of the responsibility for developing, with faculty guidance, an individualized academic program. The degree is awarded upon demonstrated competence through projects, tutorials, independent study, and an examination of competence.

Salient aspects of the PLAN include:

1. degree requirements measuring the achievement of competence rather than the traditional accumulation of academic credits;

2. individual freedom in the planning of the educational process, rather than a rigid, prescribed curriculum;
3. a large component of self-initiated investigation rather than passive classroom participation; and
4. new instructional methods emphasizing education as a cooperative venture between students and faculty.

The new degree requirements demand of the student a demonstration of competency by:

1. successful completion of a competency examination in the major field;
2. successful completion of one qualifying project in the major field of study, (the MAJOR QUALIFYING PROJECT or MQP);
3. successful completion of one qualifying project emphasizing interactions among technology, society and human needs, (the INTERACTIVE QUALIFYING PROJECT or IQP); and
4. establishment of a sufficiency in a minor area (humanities for engineering or science majors, science/engineering for humanities majors).

Thus, of only four degree requirements, two specifically identify project activity. Administratively, the provision of meaningful educational opportunities to complete the MQP requirement is relatively straightforward. Indeed, engineering and science faculty traditionally have a wealth of experience in such activities. Implementation of programs to provide opportunities of similar rigor to meet the IQP requirement is comparatively much more difficult. While both types of projects have been completed at the Washington Center, its prime function is to provide IQP opportunities.

The Interactive Qualifying Project

The interactive project is a broad and integrative educational experience. It aims to make the student sensitive to general social problems, able to question, criticize or reinforce prevailing ethics and value concepts, aware of societal-humanistic-technological interactions, able to analyze these interactions and to make better judgements and policy recommendations on issues that affect society.

The following educational goals have been established for the IQP:

1. to create an awareness of socially-related technological interactions;
2. to enable the identification of socio-technological systems, subsystems, and the linkages between them;
3. to cultivate the habit of questioning social values and structures;
4. to develop and integrate the skills of evaluation and ana-

lysis in the societal, humanistic, and technological disciplines
5. to provide methods for assessing the impact of technology on society, and human welfare, and the impact of social systems on technological developments; and
6. to encourage the recommendation of policy.(1)

The Washington D. C. Project Center

Preparation for an off-campus project center to provide IQP opportunities that would meet the above objectives, was begun in the 1972-73 academic year. In the following year, Washington D.C. was selected as the site for the center. A special preparation course for the students was organized on campus in the Spring of 1974. This course, given to all students preparing for activity at the center, requires each project team to develop a complete project proposal before the project can be initiated. In September 1974, the Center went into full operation. By June 1975, a total of twenty-eight qualifying projects were completed in cooperation with fourteen Washington-based organizations by a total of sixty-six students.

Appendix A contains an abstract of each project completed at the center, as well as the names of the organization that cooperated in its implementation, the names, majors and years of graduation of the students and the names of the faculty advisors.

Scope of Manual

This report is divided into presentations of the experiences associated with program development, implementation and follow-up. Figure 1 depicts the time-frame of each of these three phases in relation to the time of writing of this report. While the report is limited to a discussion of events in the first year of operation, for continuity, Figure 1 includes both the first year-and-a-half proof-of-concept stage and the first year of what will be steady-state operation (the 1977-1978 Academic year).

The half-year interim period between the proof-of-concept phase and the steady-state phase is felt necessary for the completion of an adequate evaluation, feedback and planning process.

Figure 2 presents the responsible parties for carrying out each task in the development, implementation and follow-up stages for each of the first three years of the center. As such it serves as a synopsis of the activities discussed in the remaining chapters.

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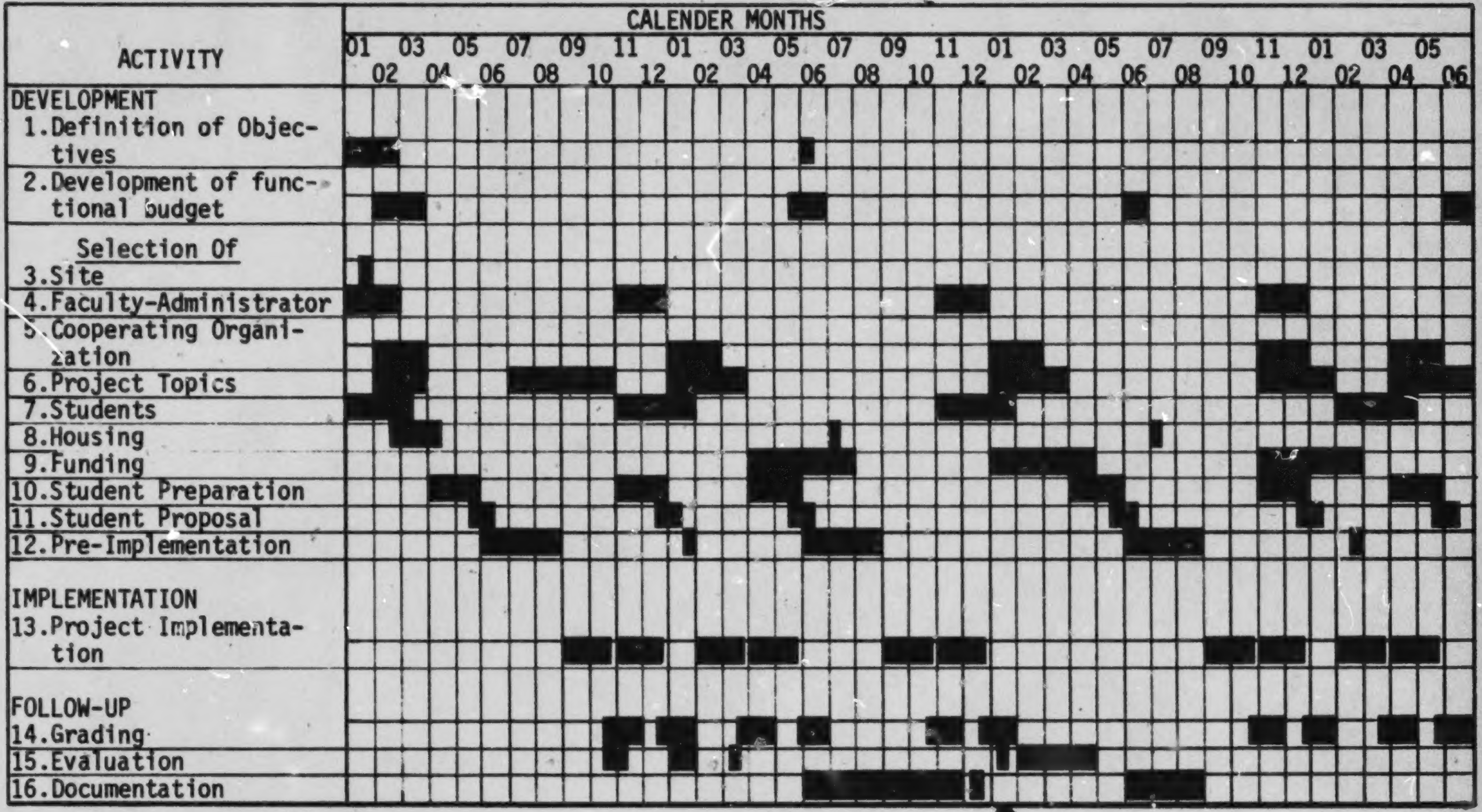
(1) "The Interactive Qualifying Project", a Worcester Polytechnic Institute Faculty Committee Report (1972), Prof. Imre Zwiebel, Chairman.



Time of Present Report:

Figure 1. Time frame for the Washington D. C. Project Center Program

ACTIVITY	Center Director			Academic Dean			Projects Administrator			Organization Liaison			Faculty Advisors			Preparation Course Teacher			Students		
Year	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
DEVELOPMENT 1.Definition of Objectives	X	X		X			X														
2.Development of functional budget	X	X	X	X	X	X	X	X	X												
Selection Of																					
3.Site	X						X														
4.Faculty-Administrator	X	X		X	X	X															
5.Cooperating Organization	X	X	X				X	X	X												
6.Project Topics	X	X	X				X	X	X	X	X	X									
7.Students																X	X	X			
8.Housing							X	X	X												
9.Funding	X	X	X	X	X	X	X	X	X												
10.Student Preparation	X												X	X	X	X	X	X	X	X	X
11.Student Proposal													X	X	X	X	X	X	X	X	X
12.Pre-Implementation	X	X					X	X	X					X	X					X	X
IMPLEMENTATION 13.Project Implementation	X												X	X	X				X	X	X
FOLLOW-UP 14.Grading													X	X	X						
15.Evaluation	X	X	X	X			X	X	X			X			X			X			
16.Documentation	X	X	X				X	X	X									X			

Figure 2. Definition of Program Task Responsibilities

II. DEFINITION OF PROGRAM OBJECTIVES

The first step in establishing an off-campus project center is the definition of its purposes. A working definition requires explicit development of:

1. the educational objectives of the academic functions being performed,
2. the professional development objectives of the faculty responsible for the academic implementation of the program,
3. the administrative and financial objectives of an off-campus center,
4. the portion of the student body to be served, its collective career objectives, and its educational needs, and
5. the objectives of the organizations cooperating in the program.

Educational Objectives

As stated earlier, the primary purpose of the center is to provide opportunities for the completion of Interactive Qualifying Projects. While the Zwiebel Report (1) established the general educational objectives for all IQP's, it was felt that an off-campus project center could be administered more effectively if the educational objectives were more specific. In addition to the general IQP objectives, the following objectives were developed to provide an operational framework for the faculty advisors at the center.

1. The application of technical/scientific knowledge, and a recognition of its restrictions and limitations.
2. The application of social science knowledge.
3. The acquisition, review and interpretation of new knowledge (new to the student)
4. The analysis of policy options (not the recommendation of policy).
5. The acceptance of professional-level responsibilities.
6. The creation of a problem-solving methodology or the combination of methodologies.
7. The definition and decomposition of complex problems in a system context.
8. The development of interpersonal skills.
9. The development and demonstration of written and oral communicative skills.
10. The interpretation of organizational functioning.

Such objectives are obviously faculty derived. The interpretation of the relative significance of each and thus its attainment is primarily a faculty decision, made in light of the specific background of the faculty member, the individual student, and the cooperating organization.

Often, the most valuable of the achieved objectives are those which are least externally measureable and perceptible to the student. He or she has almost unknowingly acquired new found skills, new talent, self-confidence and maturity, for which a direct source of acquisition is unattributable.

Faculty Development Objectives

There is one vital aspect to an off-campus project center. If it is to succeed, the faculty members responsible for its academic achievments must be at the center. To the typical faculty member, that has several drawbacks; such as separation from his department, his associates, his research, his consulting, and his students. While this separation is relatively short in length, and not absolute by any means, it is nevertheless, quite real.

As compensating factors, an off-campus program should be capable of providing opportunities for its faculty to develop new associates, new research, new consulting. If these opportunities for expansion of professional experiences are not available, it can be safely assumed that faculty would not continue to participate in the program.

The center should also provide a meaningful experience in the academic development of the faculty member. The blend of project topics and the cooperating organizations should offer a complement of investigations and contacts both in and out of the teacher's specific discipline. The projects would thus offer the opportunity to develop a working knowledge and data-base for related project activities upon return to the campus.

A variety of topics, while demanding on faculty time, also offers the advantage of identifying new research or consulting activities, and personal exposure to the organizations directly responsible for contracting such work. In this sense, exposure to the goals and objectives of the cooperating organizations is one of the most rewarding experiences associated with off-campus activity.

An off-campus project center, while appearing to be a disadvantage from the one point of view, is also advantageous from another. To the degree that the faculty are separated from their other responsibilities, an essentially full-time effort can be devoted to project advising. Such an opportunity to be free of classroom teaching and committee assignments is quite rare. It allows concentration on the teaching skills necessary for excellence in project advising, and also allows the simultaneous feedback of trying several different advising approaches on a variety of topics.

Another aspect of the center's operation that directly relates to faculty development is the concept of co-advising, two faculty members working together on each project topic. Such an arrangement is the most fruitful exercise that the faculty encounter. It fosters debate, exposure to the detailed analysis of a colleague, and the exchange of teaching techniques.

Finally, no academic work load should be considered as a 24-hour, 7-day-per-week assignment. An off-campus experience affords faculty the opportunity to participate in a broad range of new social and cultural activities during his free time. Washington, D. C., as the site for the center, offers countless museums, theatres and places of both historical and national interest to the participating faculty and students.

Administrative and Financial Objectives

The fact that two faculty members are to co-advise projects establishes the minimum number of students that can participate in the program. The work load of two full-time-equivalent-faculty (FTEF) becomes the basic administrative unit. As a rough guide, two FTEF would correspond to a range of fifteen to twenty-five students working full-time in project groups of two or three. Larger programs would be accomodated in multiples of these units.

In the first year of operation, essentially a proof-of-concept period, the smallest potentially successful academic unit is appropriately advised by two faculty members. In the operation of the Washington Center, one faculty member, the Director, was on-site for the entire academic year. The second faculty advisor, was rotated each academic term.(2) Thus a total of five faculty were involved in the center's operation. Administrative support of these faculty was provided by a Projects Administrator on campus, who has the responsibility for supporting the project activities of the entire institute.

There are nine administrative and financial functions which can be tested by an off-campus project center dealing with interdisciplinary problem-solving. With specific reference to the Washington Center, these objectives can be presented by nine questions.

1. In regard to the implementation of the school's educational objectives, what progress has been made?
2. Can an intensive effort be made to focus campus attention on interdisciplinary activities at the societal-technological interface?

---

(2) WPI's academic year is divided into four terms of seven weeks duration. The equivalent of three courses in a term is a student's full load, or one student-unit.

3. Are the faculty able to advise students in an interdisciplinary problem environment while separated from the campus?
4. Are students capable of achieving academic goals without access to on-campus resources?
5. Are the peer review systems of promotion and tenure capable of recognizing faculty accomplishments in this area?
6. Is the impact of the school's new visibility through the program beneficial?
7. Can a budgetary process be devised to allow the flexibility required to function, and the accountability required to establish, a separate and distinct operation?
8. Can a center exist outside of the normal matrix organizational structure to better respond to interdisciplinary affairs?
9. What will be the impact of returning students and faculty on the campus?

Each of the above questions are discussed in the following section. It should, however, be obvious to the reader that some of the questions are extremely difficult to answer, and it may be several years before an adequate response can actually be provided. Approaches to the answers are presented in Chapter V.

1. In regard to the implementation of the school's educational objectives, what progress has been made?

In establishing Interactive Qualifying Projects as an educational vehicle, WPI has embarked upon a new educational pathway. The results and benefits may not be readily discernable within the product, its students, for several years. Particularly in the on-campus environment, it becomes exceedingly difficult to stand back, examine and evaluate the results and progress which have been made. An off-campus project center affords an excellent opportunity for assessment of innovative educational processes. It brings students in close contact with external assessers, who, being separated from the host school, can more readily measure, evaluate and compare the process to more familiar ones. Whether this evaluation is done formally or merely through day-to-day contacts with the faculty advisors, it serves to provide very valuable and meaningful external feedback to the college and its educational planners.

2. Can an intensive effort be made to focus campus attention on project activities at the societal-technological interface?

Informal discussions between center advisors and their colleagues, as well as more formal meetings, such as a Project Management Faculty Conference, provide the opportunity to reflect on the relative effectiveness of project methodologies, and to assess and share the results of these efforts.

One of the documentary elements of the PLAN is the maintenance of all qualifying project reports in the school library. Another complete set of all the Washington Center's final reports are maintained in the offices of the campus Project Office.(3) Thus, all Washington reports are quite easily accessible to both the faculty and the student body.

3. Are the faculty able to advise students in an interdisciplinary problem environment while separate from their colleagues?

A crucial question to the implementation of a total education in technological schools is whether or not engineering faculty can effectively teach students anything worthwhile other than the workings of their own disciplines. It would be somewhat hypocritical to proclaim the need for engineering and science students to explore the socio-technological interface, and send them solely to social science faculty for that experience. In an on-campus setting, the problem is not as severe because faculty have the ability to seek each other out for assistance.

4. Are students capable of achieving academic goals without access to on-campus resources?

With a student selection process that is fairly open in terms of past academic achievement, the opportunity is presented to determine if the existing student body can achieve the educational goals set out for it by the institution.

The capabilities of a student with an inferior academic record are challenged at an off-campus center to a greater extent because of the isolation of the effort.

Denial of access to on-campus resources may often be found to be more than off-set by the resources provided by cooperating organizations. This, coupled with intensive efforts on the parts of both faculty and students may readily tend to produce a level of academic quality superior to that normally provided on campus.

5. Are the peer review systems of promotion and tenure capable of recognizing the faculty accomplishments in this area?

While this question will not be put to the test until the passage of one or two more academic years, it is an area that requires some thought. As faculty at engineering and science schools are typically conservative, appropriate recognition of colleagues' efforts in innovative areas may be difficult to grant. Accordingly, there is a clear need for the Program Director to document the teaching and creative scholarship contributions of the program's faculty.

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(3) The Projects Office is an administrative support structure to faculty and students in the implementation of project activities with off-campus organizations, as well as for on-campus projects.

This fact presents a logistic problem to the Director, If he continuously requests letters of opinion on the teaching ability and level of performance of the faculty from the organization liaison, he must sacrifice asking for letters of evaluation of the program, the students and the final reports. In the first year of operation, obtaining honest evaluation of any aspect of the program, including its faculty, is hindered by the self-imposed limitation on liaison time devoted to a new effort.

As it is virtually impossible for peer review groups to recognize faculty contributions with no informative input into their decision-making process, the soundest recourse is for the Director to insure that both the Dean of Undergraduate Studies and the Dean of Faculty are directly exposed to the program's operation and to the faculty's performance at various stages of implementation.

6. Is the impact of the school's new visibility through the program beneficial?

Exposure of faculty to a number of diverse Federal agencies potentially benefits the research efforts of the institution and the faculty themselves. It may provide an educational process to faculty on the workings, needs and goals of Washington-based research sponsoring organizations.

In addition, alumni in the vicinity of the Center are afforded the unique opportunity to meet, and perhaps work with, the students and faculty of their alma mater. If nothing else, an off-campus center virtually assures that alumni will become more familiar with the educational objectives of their college.

7. Can a budgetary process be devised to allow t[illegible]lexibility required to function, and the accountability require[illegible] establish, a separate and distinct operation?

A difficulty exists in financing programs similar to the Washington D. C. Project Center. On the one hand, the most logical sources of income are the individual organizations cooperating in the program. On the other hand, this type of funding does not provide sufficient front-end funds to adequately plan the program before the actual initiation of projects. As a result, funding by cooperating organizations cannot, of itself, maintain an off-campus center. Income from student tuition commensurate with the level of student enrollment in the center is required. Where institutions have established cost centers of other types, the budgetary format would be similar.

A cost center concept with separate and distinguishable income and expenditure accounts, is the most plausible means of operating an off-campus center. It offers the accountability needed for several income sources, and establishes the necessary degree of managerial authority and responsibility.

8. Can a center exist outside of the normal matrix organizational structure to better respond to interdisciplinary affairs?

The normal drives of a typical academic department are to:

a. maintain an academic strength in a particular discipline,
b. maximize its internal political influence in relation to other departments.
c. champion the significance of the discipline,
d. increase the quality and quantity of its staff, and
e. obtain financial support for those operations which meet the disciplinary objectives of the department.

Because an off-campus interdisciplinary project center could be interpreted as a competing influence within a departmental system, it would be reasonable to assume that most departmental organizations would be somewhat opposed to its establishment.

9 What will be the impact of returning students and faculty on the campus?

The impact of returning students and faculty on the campus will depend on several conditions, which follow.

a. The number of juniors in the program.
b. The concentrations of past participants in campus housing.
c. The propensity of the participants to write of their experiences in campus publications.
d. The number of activities which cause past participants to gather as a group.
e. The level of faculty interaction with other interested faculty on an informal basis.
f. The number of students provided academic program advice by the returning faculty.
g. General publicity through campus public relations about the center.
h. Novelty items which identify with the center.
i. The attitude of the returning students and faculty.

a. Juniors in the program are significant because they are normally moving into the leadership position of the student body in the second half of the junior year, just after returning. They also will be on the campus for the entire next academic year.

b. The concentration of past participants in campus housing is very important. Several students living in a fraternity, for example, recounting their experiences in the presence of other students, will provide one of the most important factors in attracting other students to the program. Returning students have demonstrated a much keener interest in politics on the national level. They tend more to watch national, political addresses and discuss newspaper articles of national importance.

If the students are too dispersed they will not be able to interact in the above ways.

c. Several students have written articles for the campus newspaper. These are quite important in creating and maintaining an awareness of the center within the student body. The articles have been candid and positive. Unfortunately, not all students have contributed their views in this way.

d. Group gatherings such as wine and cheese parties, evaluation meetings, and discussions with next year's candidates all help to maintain a sense of involvement and excitement. Two to four such activities of a variety of formats are usually possible in the fourteen-week period following return.

e. Faculty interactions and discussions in the coffee lounge, at meetings, and at social gatherings result in a high level of interest on the part of those who have not participated.

f. Faculty advising students and enthusastically recommending the center to advisees will have a significant impact on student interest and awareness.

g. The Public Relations office can write about the activities for alumni and students alike. The information sent to parents creates a sense of pride in belonging to an organization with this type of highly visible activity.

h. The first-year students returned with a shirt on which they had designed a Washington D. C. Project Center emblem.

i. Many students have developed a sense of inner pride simply because they belong to WPI - a college with a Washington Project Center. This feeling has helped to generate pride and involvement on the part of the students in the college.

Student Selection Objectives

The Interactive Qualifying Project is very strongly recommended for all students. In essence, then, the entire student body is available for selection to the Center.

There are several possible classifications for reducing the availability of the program to the student body at-large. For example, the program could be opened to only those students who meet one or more of the following criteria:

1. students who have completed at least two or three years of their academic program, i.e., upperclassmen;
2. students who have distinguished themselves by maintaining an academic record at some level above the average of their classmates, i.e., an honors program; or,
3. students who have previously demonstrated their ability to perform well in project efforts.

Such classifications are useful if the decision is made that the financial burden of a large off-campus center is not feasible. In the operation of the Washington Center, no such pre-determined criteria for student selection was employed, although the program was primarily aimed at upperclassmen for two reasons. First, the beginning of a new program not favoring upperclassmen would mean that those students in their senior year would not have a second opportunity to participate if an underclassman participated in their place. Second, it was generally felt that, again, because of the newness of the program, upperclassmen would be better suited to facing the unexpected than their younger peers.

In place of pre-determined criteria, all students were notified of the opportunity to apply for a position at the center. Students who applied were then individually screened, so that the total number attending would be within the range determined by the administrative and financial constraints of the first year's operation.

The selection of students for participation in an off-campus Project Center necessitates balance between many conflicting objectives. From the viewpoint of assuring highest quality project performance to the sponsoring agencies, one would tend to select students with superior academic performance, who posess exceptional oral and communicative skills, and have gained prior on-campus project experience. Conversely, from the viewpoint of educational objectives, one may argue that such a superior student would gain only marginally, and that less academically exceptional students should be selected, for whom the incremental educational gains would be far greater.

Indeed, an off-campus project offers a rare opportunity for virtually all types of students. The exception would be a student not prepared for the emotional dilemmas of living and working with his peers, in an environment with performance pressures similar to those encountered in one's first professional appointment. If personal problems or family pressures are bothering a student, they seem to be intensified during what becomes a very long academic term.

As all students enter into qualifying projects for the purpose of satisfying degree requirements, the decision to participate in the

Washington Project Center is motivated by one or more of the objectives listed below.

1. More Interesting Projects with Better Logistical Support. The opportunity to provide input, in the form of a working document, to a well-known functioning agency on a topic of current concern, has considerable student appeal. The organizations associated with the Washington Project Center provide better logistical support for the projects than would normally be available on any campus, both in terms of data availability and clerical support.

2. Opportunity for a Concentrated In-Depth Study. The opportunity exists to devote a 100 percent effort to the project, and to complete it within one term. Students have also generally recognized the higher potential to produce a quality report by coming to the Washington Project Center.

3. Pre-Job Experience. The opportunity to function in a high level organization at an almost professional level provides valuable experience. Students are potentially motivated by being able to reference this experience when seeking permanent employment.

4. Improved Skills. The center offers greater opportunity for direct improvement of interpersonal skills. These include improved ability to accept new situations, improved oral ability, and improved abilities in project scheduling and meeting deadlines. The center experience is viewed as challenging, and, due to its short intensive nature, can bring about a quantum change in a student's ability to accept responsibilities.

5. The Social Experience of Living and Working in Washington.

6. Close Faculty Contact. The nature of the project center operation allows closer faculty contact in a more neutral setting than is available on campus.

Cooperating Organization Objectives

Cooperating organizations have generally been quick to realize the distinct educational benefits of students addressing real life problems.

The following are some of the objectives organizations seek to achieve by participating in the program.

1. A student group provides a valuable resource in terms of a research team. By properly defining the problem, the agency can receive a report which can be utilized as supporting material in an on-going or up-coming study.

2. A professional satisfaction results from participating in the educational process.

3. The program offers the opportunity for close contact with faculty members, thus providing a different and valuable perspective of agency problems.

4. There is a distinct advantage to participating in a program which has projects on similar topics in several different organizations. A broad-based insight into how different groups are dealing with a similar problem can be provided.

5. Most organizations devote some portion of their resources to recruitment of recent graduates for employment.
The center affords this opportunity both to the organization and to its own students.

III. PROGRAM DEVELOPMENT

General

Once the program's objectives are clearly defined, several tasks need to be accomplished prior to the actual implementation of off-campus projects. The following sections present the most significant pre-implementation steps needed to insure some level of success in the program.

Site Selection

The selection of a site for an off-campus center is the first step following the definition of the program's objectives. In the present case, the ultimate choice was Washington, D. C., for reasons presented below.

In attempting to achieve the educational objectives of Qualifying Projects as presented earlier, several types of projects are possible.

1. The problem-solving type, in which the student applies analytical techniques to available data in order to select and recommend possible courses of action.
2. The advocacy planning type, in which the student advocates social change and develops the means for resolving certain disparities or inequities in society.
3. The experiential field-work type, in which the student participates in community activities, and works with public or private organizations, to gain experience which would enable him to meet the stated Interactive Qualifying Project objectives.
4. The theoretical type, in which the student develops a new model, or extends existing models, for analysis and prediction of interactive effects.
5. The historical-study type, in which the student traces the antecedents of societal, humanistic, philosophical, or artistic phenomena in interaction with technological, scientific developments, and places them in perspective.
6. The technological assessment type, in which the student gauges and evaluates the impact of some existing or proposed technological development on society and human values.

To provide the flexibility for accomodating all these project types, the center site must have access to a variety of organizations. It should be noted that University Urban Research Centers of the late 1960's usually provided opportunities in only type 3 projects, and few are able to claim a large degree of success.

Providing project topics capable of interpretations that could be classified into more than one project type allows a greater potential to adapt to the educational needs and interests of the student. If such flexibility is not provided in the project topic selection, the faculty members are, in essence, being limited in their authority to determine the academic acceptability of the project.

There are not very many sites that afford opportunities in all project types. In fact, only three alternative sites were given serious consideration; Boston, Massachusetts; New York, New York; and Washington, D. C.

Boston, although offering a full variety of opportunities both with private organizations and government groups (local, state and federal), was eliminated primarily because its proximity to WPI permitted project activities to be developed without an off-campus site being distinctly identifiable. In fact, projects were already developed in cooperation with the Integovernmental Relations Committee of the Boston Federal Executive Board, as well as with many other groups. These projects are administered directly through WPI's on-campus Projects Office.

The final choice between New York and Washington was based on the opinion that, while both presented a myriad of possible project topics, D.C.-based organizations seemed to have problems that were more directly related to the educational objectives of the program.

Several other characteristics of the Washington area make it an attractive site for an off-campus project center.

1. Student exposure to Washington-based organizations is desirable even without career objectives in government work, in that most engineering positions require some involvement with Federal programs.
2. This involvement is also current, implying student exposure to the daily interaction of technologically based organizations with government agencies.
3. The prestigiousness of having worked with a D. C. organization has a positive effect on the student's hiring potential upon graduation.
4. A Washington Center provides increased visibility of the school's programs to the most concentrated source of financial support for postsecondary education in the Country.
5. The information resources in the District are both unique and unrivaled.

Selection of Cooperating Organizations

To assure a reasonable level of confidence that the objectives of the program can be achieved, criteria for selecting a cooperating organization must be established early. The criteria being used for WPI's center are discussed.

1. Agency Involvement in Educationally Appropriate Projects

There is no sufficient substitute for the face-to-face meeting of the educator and the organization liaison in determining the mutual acceptability of a project topic, and its scope. Definition of an appropriate problem for students to addresss is obviously the significant step in assuring the desired potential for attainment of the educational objectives of the program.

Two differing motivations always exist in these meetings. The educator is seeking the optimization of student attainment of the educational objectives. The liaison is seeking the distribution of scarce resources (his effort, his staff's functions, secretarial support, and work space) in the maximization of output toward the mission of his office. While these motivations are different, they are not necessarily mutually exclusive. Figure 3 presents a crude definition of the feasible solution space which does not violate the constraints of either party.

An interesting sidelight to Figure 3 would be to superimpose an indifference map. The optimization of mutual objectives could then be interpreted as a result of the relative weights placed on attaining educational objectives and organizational results. The predominant determinant of the shape of the curves, and thus the point of optimality, is the effort of the faculty in advising the students relative to the effort of the organization liaison in directing the students. If the faculty effort is greater, the assurance of attaining the educational benefits is greater. It should be noted that the above system has a built-in feedback mechanism, in as much as liaison involvement essentially services the attainment of both objectives.

2. Suitability of Agency Personnel to an Educational Program

Once the project topic has been mutually agreed upon, then the personal traits of the liaison come into play. Perhaps the ideal liaison is one who:

a. enjoys the experience of interacting with students and faculty,
b. has the ability to provide experiential insights into the relative promise of alternative solution paths,
c. is nourished by the act of debate,
d. possesses a familiarity with the available and not-so-available information resources of the topic, and
e. is in a position of responsibility that allows him the flexibility to try new approaches to solving problems.

Such attributes as above can sometimes be accurately forecast by observing the responsibilities of a liaison's position.

3. Opportunity for Meaningful Impact of Student Output

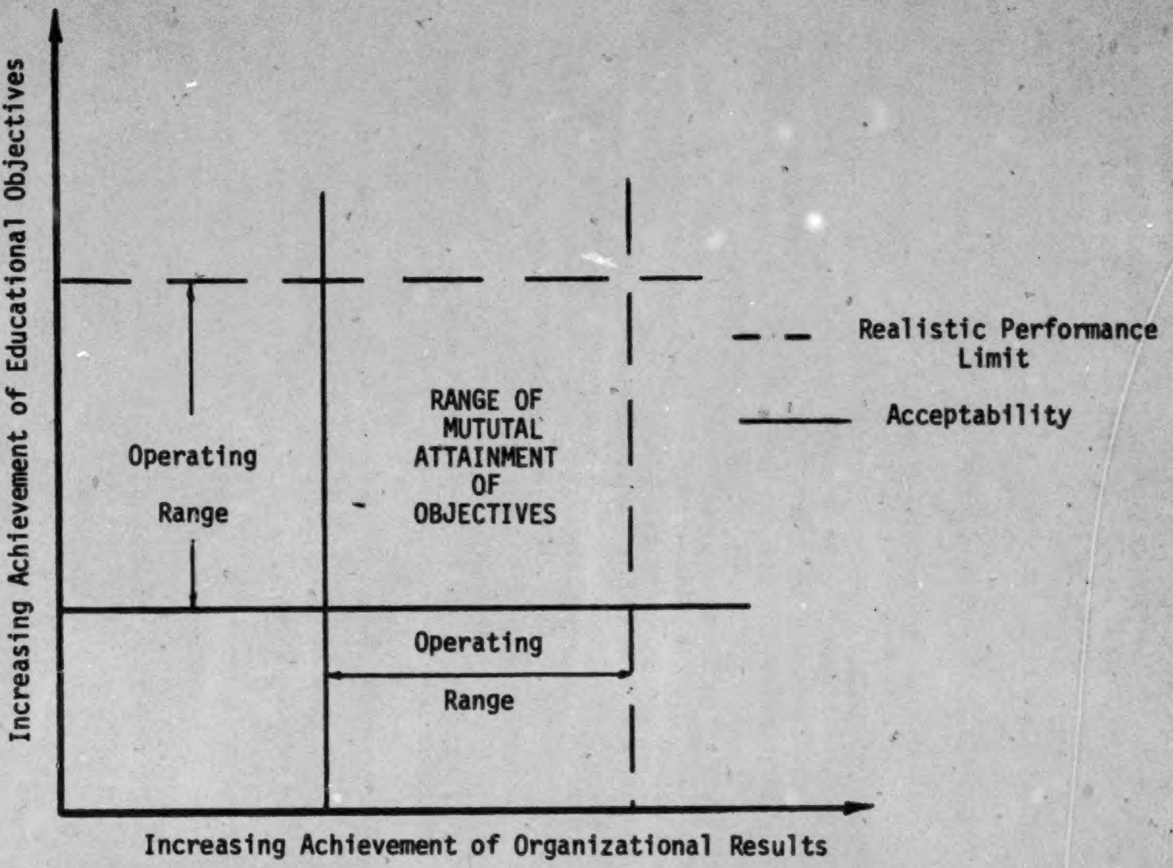
Increasing Achievement of Educational Objectives
Operating
Range
RANGE OF
MUTUTAL
ATTAINMENT
OF
OBJECTIVES
Operating
Range
Realistic Performance Limit
Acceptability
Increasing Achievement of Organizational Results

Figure 3. Limitations on Objectives Attainment

Selection of a potential cooperating organization should also be based on the realization that students do not do busy work without recognizing it for what it is. At the same time, students are surprisingly eager to make a sincere concerted effort to attempt a solution to a meaningful problem. If, after a massive effort, a student report is to be shelved for lack of interest, it may well be that the students are being done more harm than good.

The usefulness of a student report to the liaison varies considerably. Some of the possible uses for complementing organization functions include:

a. bringing the liaison up-to-date on a topic anticipated to be of future concern,
b. adding depth to shallow sections of an in-house study,
c. supplementing organization reports, issue papers, RFP development, annual report sections, and the like, and
d. providing the liaison with a tangible document that others may have been reluctant to produce.

4. Potential Long-Term Involvement

As the efforts involved in developing a cooperating organization contact are considerable, initial agency selection should consider the agency's potential long-term interest in the program. Similarly, as not all academic projects are performed at the center, the agencies selected should logically be those that can cooperate with the academic community in other endeavors. Such spin-off, in the form of on-campus projects and research endeavors are obviously provided a rather strong data base, as well as faculty who have just spent a considerable amount of time with the topic. In fact, release time for faculty advisors when they return to campus may well be a very wise investment in terms of its potential for successful proposal writing.

5. Political Considerations

In any faculty, no matter where they teach, there will always be individual members with divergent educational beliefs. The spectrum runs from conservative traditionalism to liberal experimentalism. Occasionally, it is difficult to separate these educational beliefs from the political subtleties of the organizations cooperating with the program. If that is the case, it may turn out that individual projects are more attractive than others, on a basis of other than academic considerations.

If the topic problem has built-in constraints on the analysis, it will not succeed in an educational sense, despite all of the so-called experiential learning that will occur. The resulting friction between the participants in the attempt to make it successful ultimately terminates the relationship.

6. Scheduling a Blend of Organizations

There exists a symbiotic characteristic to an off-campus project center that should be developed to its fullest. By carefully selecting a blend of complementary topics with a diverse assortment of agencies, students soon discover that they can learn from each other. A collectivism develops which is both educationally exciting and personally rewarding.

Developing Cooperating Organizations

Crucial to the success of the program is the institution's ability to identify and enlist a variety of site organizations to cooperate in program activities which have a major focus on educational goals.

The very first contacts are always the most difficult, and finding personnel in Washington that are willing to participate in a new educational program that has no prior documentation is certainly no exception. In the development efforts for the present program, existing contacts of faculty familiar with the program were utilized. While these personal relationships were small in number, they were instrumental in the initiation of a natural process that expands the number of new opportunities with each meeting.

The initial efforts were begun in the summer months of 1973, some fifteen months prior to the actual opening of the center. From that summer until the following February, the development program was implemented by several faculty members under the direction of WPI's Project Administrator.

The usual procedure employed to obtain a project topic and a commitment from an organization to cooperate in the program consists of the following steps:

1. an introductory meeting,
2. a follow-up letter,
3. a second meeting producing a specific project description draft, and
4. subsequent projects.

1. Introductory Meeting. The overall objective of the initial meeting with an organization is simply to establish a personal relationship. Perhaps the most productive agenda for attaining this goal is to present a capsule summary of the institution's goals and the objectives of the center (in a period of time no longer than several minutes). Soliciting an equally brief description of the organization's mission allows a mutual base for each participant to determine if the meeting should continue, or if a different person in the organization would be more interested.

The remainder of the meeting should be spent in discussing the steps to be completed if a project is to be performed, and the time frame in which completion must take place.

Any aspect of the program which may not be particularly appealing to the organization should be identified, e.g., eventual funding, the fact that submittal of a project topic does not guarantee that it will be selected, the provision of a work space, supplies, and clerical support for the students, etc. The fact that the program is an educational endeavor cannot be understated. At the same time, the institution's past accomplishments with off-campus project efforts, and the maintenance of quality through faculty supervision are the two strongest facets of the program in terms of creating an interest on the part of organizations in participating.

The final minutes of the initial meeting should include a mutual discussion of the types of project topics which will be educationally admissible, and the types of problems normally worked on in the organization and of importance within the program timetable. The meeting should end by suggesting that all participants give some thought to several possible project topics during the interim period before the next meeting.

2. Follow-Up Letter. The essential elements of the initial meeting should be set in writing to reduce the possibility of misunderstandings. Exhibit I presents a typical follow-up letter. It is important that such a letter be in the hands of all who participated in the first meeting, as quickly as possible. The organization liaison should be reminded that a project description should be purposely brief to allow students a certain degree of flexibility in defining the topic themselves. Please note that the letter displayed as Exhibit I follows a highly successful first meeting, in that the project topic had already been agreed upon.

In the majority of organizations, this will not be the case, and a second meeting is usually required to define the project topic.

3. Second Meeting. The sole purpose of this meeting is to define a general project topic that is both acceptable to the faculty in the program, and to the organization's liaison. For this reason, both the Projects Administrator and the Faculty Director must be present. The Projects Administrator has the responsibility of solving logistical problems as they come up, because the submittal of a project description is a written committment to participate in the program. The Faculty Director has the responsibility of assuring that all appropriate components of an educational nature can be read into the project description.

Once the project description has been discussed, a deadline must be established for receiving it in letter form. Subsequent to this meeting it is occasionally advisable to draft the letter for the organization liaison's approval.

WPI WORCESTER
POLYTECHNIC
INSTITUTE

Worcester
Massachusetts 01609
(617) 753-1411

Exhibit I

Dear Sir:

Thank you for a most enjoyable meeting during our recent visit two weeks ago. Our discussions with you provided an extremely positive start to a very successful week in the development of our Washington Projects Program. In response to our discussion, I am sending you an outline of the program which we propose to conduct with you.

Our discussion concerning projects focused on the development of a monograph, to eventually be used in engineering education, dealing with the interaction of human-technical problems in an undertaking such as bringing education into remote areas via satellite communication systems. The project would be divided into two parts per your conception of the major components of the total problem. We propose to have a student group consisting of three students on site in Washington during September and October of this coming fall. A second group of three students would participate in the second part of the project during February and March of 1975.

We request that you designate space in your organization for the students. The students will divide their time between their activities at your agency and at the WPI Projects Center. We anticipate that they will spend approximately four days a week pursuing information at the agency. One day a week will be spent at the WPI Projects Center and will be used for discussions with the faculty advisors and other students listening to lectures, guest speakers and planning additional efforts on the project.

We suggest a regular weekly meeting be scheduled with you, the faculty and students to review the current accomplishments and plans of the group and suggest specific tasks or chores that you feel should be incorporated. The faculty will thus share a significant portion of the responsibility for making the total experience successful. Your input is, however, very important for an exciting and highly motivating experience. We are quite confident, from our past project experience, that this will be one of the most successful aspects of the program.

As we discussed at our prior meeting, we do not need significant support for the anticipated activity during the experimental phase of our program. We do, however, request your assistance in the form of access to reports, publications, telephones, unusual travel which you feel will benefit the outcome of the project, xeroxing, miscellaneous stationary supplies for office functions, postage and secretarial assistance preparing correspondence and final report.

Exhibit I. (continued)

Our students may be viewed as independent contractors relative to your organization. They carry their own student, medical and health insurance plans and will be covered under WPI's general liability policy.

We will be preparing the student group for their project during the coming months of April and May on the WPI campus in a course designed especially for that purpose. As part of that preparation, the students will address the project in which they will be involved in Washington. From our prior experience, we have found that a letter requesting the students to undertake the project with a statement of the project objective coming directly from the organization supporting the project is a highly motivating way of initiating the student group's activity. We thus request you to assist us by providing a letter on agency stationary which includes the following information: 1) an introductory paragraph stating your anticipation of an interesting experience working with WPI, 2) an invitation to the students to locate at your organization and work on the solution of the problem, 3) problem statement of one to two paragraphs which briefly describes the nature of the problem and the objective to which the students should address themselves, 4) specific information or resources which the students should begin to review in pursuing the objective, and 5) information concerning the organization itself or references in that regard including general personal information useful for orienting the students to the staff in the organization and their backgrounds.

Again, thank you for your generous response to our program. We look forward to working with you next year and to a very successful project.

Sincerely,

Joseph J. Mielinski
Projects Administrator

Experience indicates that organization personnel procrastinate in the provision of the project description, because it is the single action which commits his office to participation in the program. While this fact makes the letter somewhat difficult to obtain, it provides the overriding advantage that the submittal of a project description is treated quite seriously.

It is useful at this meeting to again remind the organization liaison that his topic is to be presented to the faculty and students of the center along with all other topics, and its selection for implementation is not certain, being dependent on the number of students enrolled, their academic backgrounds, and so on.

4. Subsequent Projects. Once a project has been successfully completed with a particular organization, and an opportunity has been provided to mutually suggest improvements in the mode of operation, subsequent project descriptions are easily developable. Similarly, new organizations can be contacted through existing liaison, and the nature of the program can be verified by pointing to past achievements. The only challenge remaining is to obtain funding for the program directly from cooperating agencies. This aspect is treated in a subsequent section.

Student Selection and Preparation

The preparatory steps associated with the development of a student membership to an off-campus center include:

1. advertising the nature and availability of the center,
2. administering student applications,
3. interviewing students,
4. selecting students willing to commit to the program, and
5. preparing the selected students for the project activities.

Advertising

The initiation of any new program requires a significant effort in informing potential participants of the program's opportunities and limitations. To avoid unnecessary difficulties, announcements should specify what the center does not do as well as what it does do.

Two campaigns can be run, one distributing general information (usually through the campus newspaper or the closed-circuit, campus television system), the other disseminating more specific information (through seminars or informal discussion sessions).

Applications

To facilitate planning and staffing, an initial indication of student interest can be obtained by distributing applications for participation in the program as part of the advertising campaign. The applications prove most useful if they solicit the academic term during which the applicant plans to be at the center. Beyond this, requiring further information reduces the rate of response to the forms.

Interviewing and Selecting

Interviewing student applicants allows a two-way discussion of the center's operation, giving the student the opportunity to obtain more detailed information at a personal level, and giving the faculty members involved in the program an opportunity to obtain and assess information about the applicant.

One of the primary purposes of the interview is to determine if the student would benefit by the type of educational experience the center offers. As this is a somewhat difficult task to perform, three levels of interview results are developed:

1. the student would definitely benefit, and should be accepted immediately,
2. the student's background may not be so well suited to the program as to warrant immediate acceptance, and the student is placed on a waiting list, or
3. the student's background and past experiences are felt not to be adequate for him to be successful, and the student is notified to that effect.

To assist in the development of the program, interview information is also assembled on the students' academic majors, past project experiences, general interests, and the range of project topics and cooperating organizations that are of interest.

Preparation

Every student selected to attend the Washington D. C. Project Center, is required to complete a preparation course, Interactive Project Initiation. The course is offered by the Division of Interdisciplinary Affairs on a regular basis to all students, not exclusively those who are preparing for Washington.

The course has four major components:

1. the coupling of a student project group to a project topic,
2. the introduction of the student to societal-technological interfaces,
3. the identification and development of skills and techniques required of the student group to implement their particular project effort, and
4. the preparation of a proposal to the cooperating organization describing the method of attack for the specific project.

After coupling student groups to topics, the course is essentially composed of two types of activities. On the one hand, students are presented information which is of general value in addressing societal-technological issues; on the other, each student group is focusing on the particular project topic that is its responsibility.

To achieve both goals requires a significant faculty effort. Information of general value to all students is presented through normal classroom presentations by faculty and outside speakers. Information specific to particular project topics, however, cannot realistically be presented to the entire group. As such, this element of the course is assigned to the particular faculty members who will be responsible for advising the topics when the projects are finally conducted at the center.

More specific information on the course content in each of the four segments described above is presented in the following sections.

1. Coupling Student Groups to Topics

At the first course meeting all students are presented the project topics that are available, in the form of a bound collection of cooperating organization letters. The students are also provided a preference form on which they are to indicate their first, second and third choices for projects, and any preferences they have in relation to fellow group members. The faculty member most familiar with the project topics (at this point, usually the center director), provides some insignt into the general framework of each topic.

By the third meeting of the course, student groups are matched to specific topics by the course instructor. The matching requires simultaneous consideration of:

1. student preferences,
2. appropriateness to the topic of student background as displayed by his or her transcript, and
3. appropriateness of student background in complementing the backgrounds of the other students in the project group.

2. Societal-Technological Interfaces

In this component of the course, the class explores some of the many facets of the technology-society interface. Discussion topics and reading are selected from such areas as the history of technology, social values and social responsibility, the social consequences and impact of technology, ethics and ethical systems, social criticism and social programs, technology forecasting and assessment, and the workings of politics and government. Speakers and discussion leaders are invited from off-campus as well as from the faculty at large.

Given the multiple objectives of the preparation course, this exploration phase is at best a survey, a broad and general treatment of technology/society issues and questions. Where a topic being discussed bears directly on one or more of the projects, the respective groups are advised to pursue the topic in greater detail with the assistance of the faculty project advisors.

The schedule for the Term D, 1975 offering of the course is shown in Figure 4.

3. Skills Development

As an individual project team undertakes the background and research work pertinent to its project topic or problem, it soon discovers that in addition to broad issues and questions, there is a body of methdology, procedure, and information associated with the area. Skills in some of this methodology may have been obtained by one or more members of the team through prior course or project work. If this is not the case, however, it is the responsibility of the project team, with the assistance of the project advisors, to develop the necessary skills to a level judged appropriate to the demands of the project.

This might be done through course work if the schedule for the particular project is such that an academic term intervenes between the preparation course and project execution. Alternatively, it can be done by independent study; particularly helpful in this case is the availability of modular materials which focus on specific topics and methodologies, and which provide bibliographic starting points for the further development of skills.

It is at this point, early in the preparation course, that the working relationship between the project team and the faculty advisors is established. The nature of this relationship, and specific comments on the advisor's role in the project, are included in Section IV of this Guide.

4. Project Proposal Preparation

The bulk of student effort in the preparation course is directed toward the writing of the project proposal, the suggested elements of which are as shown in Figure 5. The proposal is a most critical element in the Project Center concept. The seven-week residence period at the center is long enough to carry out a successful project only if sufficient background, research, and planning efforts preceed the residence.

Proposal preparation is monitored by the project advisor in regularly scheduled, out-of-class meetings with the project team. Should questions of sponsor intent or expectation arise, the advisors will resolve the questions by direct communication with the sponsor. The final, typed proposal document is due at the end of the preparation course, at which time each team is also responsible for a short oral presentation describing the project as proposed. A copy of the proposal is normally sent to the sponsoring agency shortly after the close of the preparation course.

ID3040 TERM D75 SCHEDULE

DATE	9:00 - 10:00	10:00 - 11:00
4/3	Organization, schedule Procedures, etc.	Pres. Hazzard: On the Technological Humanist
4/8	Hand in preference sheets Resource location, Library	What is a proposal? PERT and project planning
4/10	Groups announced. Advisors introduced. Schedules established.	Dean Grogan: The IQP and WPI
4/15	Norman Faramelli Boston Industrial Mission	
4/17	Weekly progress report due. Case Studies in Engineering Ethics, Profs. Zwiep and Scott	
4/23	3:00 - 5:00 P.M. Dr. Robert Miller, Value Clarification"	
4/24	Weekly progress report due. Film on the New Alchemy	Discussion on Intermediate Technology
4/29	Ethical systems	Case discussions
5/1	Weekly progress report due. a) Washington Orientation Professor Hoffman b) Alternate activity for Worcester projects	Group dynamics and management, Professor Bjorklund
5/6	Cost Benefit and Cost Effectiveness Analysis, Prof. O'Connor	Social Criticism and Social Programs Prof. Goodwin
5/8	Typed Semi-Final draft due How Government Works - William G. Flynn	
5/13	Draft returned with comments Consumer Protection and PIRG Professor Bourgault	Protocol
5/15	Oral Reports, 10 minutes each, with AV aids	
5/20	Final proposals due, TYPED Oral Reports. 10 minutes each, with AV aids	

Figure 4. Preparation Course Schedule

1. ABSTRACT - 1 page

2. PROJECT OBJECTIVE

   A clear, concise problem statement that includes a description of the form of the final results.

3. INTRODUCTION

   Why was the project developed? How? Background information regarding the project development.

4. DETAILED INVESTIGATION OF THE PROBLEM

   This is the body of the proposal and should be divided into subheadings. It represents the results of weeks of research on the project topic. It should be clearly referenced. The following method is recommended.

5. DETAILED DESCRIPTION OF THE PROJECT

   This is a clear detailed description of what the project entails and how it will be carried out. Statements should be very specific and very detailed. What additional information is needed? What contacts need to be made? What problems do you anticipate? How will the final results be presented to insure maximum utilization? etc. This section will develop a detailed outline of the overall project. The actual outline will appear in the appendix.

6. PROJECT MANAGEMENT AND CONTROL

   Pert Chart
   Personnel
   Budget
   Logistics (Equipment, Transportation, etc.)

7. BIBLIOGRAPHY

8. APPENDICES

Figure 5. Elements of a Project Proposal

Faculty Selection and Preparation

Selection of faculty for participation in an off-campus project center involves many considerations. First, the general concept of off-campus IQP activities is significantly different from the more traditional engineering and science curriculum. Accordingly, faculty experience in prior IQP advising is very valuable and should represent a significant component of the selection criteria.

Since the projects are diversified and span many disciplinary areas, great strength in any one disciplinary area would not be nearly as important a consideration as a systems ability to tackle, dissect and structure the methodology for a diversity of problems.

Co-advising of projects permits differing faculty perspectives to focus on the same problem, enhancing the resultant educational benefits to the students and to the individual faculty. This affects not only the projects advised in Washington, but also those conducted subsequently on return to campus. Thus, it is desirable to select and pair faculty of complimentary disciplines, who are receptive to working together.

Creation of an off-campus project center can introduce significant perturbations into the normal college operations structure. It is thus important for faculty to clearly understand the precise role through which other faculty and the college administration see their participation. Where strong departmental interests are predominant in management processes, this can potentially work to the detriment of faculty who participate in an interdisciplinary off-campus activity.

Faculty academic achievement is assessed and rewarded on the basis of promotion, tenure and salary increments. The latter is often managed through individual departmental budgets. Participation in an off-campus project center serves to benefit the entire school, and not the individual department. Thus, a conflict arises as to whether one department should reward activities of such broad-based perspective. It is imperative that center faculty clearly understand the nature of this process, and that adequate measures be employed to assure recognition of their efforts. An institution-wide solution exists in terms of monetary rewards in that the Dean of Faculty can be given authority over a significant fraction of annual salary increases.

Promotion and tenure offer additional rewards to faculty for academic achievement. Traditional criteria for such rewards include teaching ability, research and creative scholarship and service to the school. Off-Campus faculty participation encompasses a blend of all three of these elements. Project advising, working closely with students, represents a form of teaching far more difficult than prepared formal classroom lectures. Analysis of project problems and the synthesis of their solutions often requires significant creativity and innovation on the part of both faculty and students.

More conservative viewers may consider only graduate-level, publishable research as research and creative scholarship. In whichever fashion this criteria is considered, it is imperative that faculty contemplating participation in interdisciplinary off-campus activities be well aware of the role the activity may play in their promotion and tenure considerations.

An off-campus center does allow the faculty to develop graduate-level research contacts with many of the cooperating organizations. This may be at the expense, however, of the undergraduate students and the projects being advised. Faculty selection must consider all of the above influences.

As with students, faculty preparation prior to their term off-campus is a vital facet for successful program operation. The faculty must personally be acquainted with the agency liaisons and fully comprehend the environment in which the project will be carried out.

The initial phase of preparation involves faculty in many of the preliminary project planning meetings with agency personnel, during which the objectives of the project center are discussed. The bulk of this effort is carried out, however, by the Center Director and Projects Administrator.

All faculty of the Washington Project Center participate as advisors in the project preparation course. They assist the students in defining the project topic, in researching background information and in developing a logical methodology for project implementation. In the midst of this course, the faculty visit the liaisons in Washington, a procedure which serves to help clarify the cooperating organizations' objectives. Scheduling of this meeting in the midst of the preparation course permits prior acquisition of valuable background information for the faculty, thus rendering the ensuing agency meeting far more productive. Enough time is still provided for students to utilize the benefits of these meetings for preparation of their project proposals. These meetings also serve to maintain personal rapport between the faculty and agency liaison prior to the faculty's actual arrival in Washington.

The project preparation course also serves to acquaint faculty with the students they will advise in Washington. On the surface this may appear inconsequential. However, even in a school the size of WPI (2,000 undergraduates) contact between students and faculty not within the same department is less than would be desirable. Thus, meeting and knowing the students, and close exposure during formulation of preliminary project methodologies serve to make the subsequent off-campus project advising far more effective.

IV. PROGRAM IMPLEMENTATION

This Chapter addresses some of the considerations of the on-site operational phase of the project center:

1. the interactions between the various program participants (students, faculty advisors and cooperating organization liaison),
2. the activities and scheduling required to complete the educational projects,
3. the desired form and content of the final student reports, and
4. the roles of academic standards and project performance evaluation.

There exists no one set of procedures that the program participants can follow to insure the successful completion of each of the very different projects that are addressed on an off-campus center. A partial list of the highly variable influences on each participant's contributions to the project effort include:

1. the abilities, strengths, weaknesses and educational backgrounds of the students in each project group,
2. the teaching approach, discipline, and personal characteristics of the faculty advisors,
3. the very unpredictable blend that results when individual students work together as a project group,
4. the extent and type of involvement provided at the cooperating organization, and
5. the symbiosis that results from the interchange occurring between groups.

The following discussion is based on the experiences that accompany the experimentation needed to run an off-campus project center during its first year. It reflects on the few operational procedures that can be successfully adapted to all individual project cases, and also on those aspects of the program which are best left to the adaptability of the program's participants.

1. Participant Interactions

Interaction between the sponsoring organization, students, and faculty advisors requires a clear understanding as to the effort to be provided by, and the specific responsibilities of, each of the participants. Although the primary responsibility rests squarely on the students, both the sponsoring agency and the faculty advisor make specific contributions to the total effort. It is important that everyone involved know the expected extent of his or her contribution, and that the students are aware of all the interactions that might occur in the total educational experience at the Center.

The contributing facets of this experience involve:
a) the students' contribution to the sponsoring agency and the agency's contribution to the project,
b) the faculty advisor's contribution to the student and to the sponsoring organization,
c) the interproject activities that should occur, and
d) the opportunities that exist in the center's site area.

a) The students' contribution to the sponsoring agency and the agency's contribution to the project.

It is expected that students will provide the same effort and standards to their project that would be expected of a beginning professional in the field. This has several ramifications because the student is working on a specific project, and because he or she has responsibilities to the organization as well as to the college in satisfactorily completing the project.

Student's hours at the agency will usually be the same as those of agency personnel, with some degree of freedom for outside research. The organization must not normally assign the student typical intern or work-study jobs at the agency. Since there is a specific project objective to be accomplished during the term, the student, with advice from the faculty and agency liaison, will be responsible for planning his method of attack, researching necessary material, interpreting and creatively solving the problem, and providing necessary oral and written documentation of his work. In accomplishing these results, the student will necessarily have to do some of his work outside normal working hours. This is typical of any professional effort and usually becomes increasingly necessary in the terminal stages of the project.

Immersion in the organization to learn organizational and interactive facets is important at the beginning of the project, and it should be expected, by all concerned, that a moderate amount of time at the beginning of the project will be spent in learning about the agency and project fundamentals.

As many resources as possible should be made available to the student so that he can accomplish as much as possible within the term. The liaison's role should be one of supporting and directing the students as he would a group of consultants. The amount of interaction between the organization's liaison and the students, however, varies quite considerably from project to project depending on the need for guidance and the type of project; just as it would from consultant to consultant.

The student should supply the sponsoring organization with his weekly work record and plans for the following week as described in the following section. This report appraises the agency of the progress of the project, and frequently spawns suggestions that ultimately lead to major improvements in the final product.

b) The faculty advisor's contribution to the student and to the sponsoring organization.

In suggesting the proper areas of influence and guidance that the faculty advisors provide the students, it must be recognized that the broad scope of specific knowledge gained by the students involved in the projects will seldom be matched by the advisors. As the project progresses, the gap between specific knowledge held by students and advisor should widen. The students will do extensive reading and have access to in-house experts. It is usually impossible for the advisor to have this kind of exposure to every project. A single project is usually a small percentage of his responsibility. In a few cases the previous experience of the advisor may closely coincide with the project topic, but this will not, and should not, always be the case.

The following are suggested ways in which the advisor can be of real help in attaining the mutual objectives of an outstanding project:

1. The advisor plans the original project objectives with the group after their initial proposal is submitted. He tries to limit and direct the proposal and help the project group in setting up a realistic set of tasks.
2. After the procedure and objectives are established, he directs the group by discussing developing phases of the project.
3. He stays informed (or becomes informed) on the theoretical bases of the project, so that he can discuss various areas knowledgeably.
4. He suggests additional areas of basic research and ramifications of project objectives.
5. He suggests project task cut-off times, if the time-objective framework indicates.
6. He sees that a task chart with individual assignments is completed at the start of the project PERT procedures, in their simplest form, should be used to determine the critical path. Tasks and accomplishments must be reviewed frequently and revised occasionally.
7. He sees that a running log, in professional form, is kept by each member of the project group, and reviews these logs frequently.
8. He reviews weekly time-accomplishment reports along with the next week's planned tasks.
9. The advisor schedules regular meetings with the whole group and is available for problem discussions as they occur on a limited basis. He avoids total involvement, however, since this is neither proper

nor educationally helpful. Many problems can be effectively solved by students alone - and should be - so that confidence in problem-solving ability can be inculcated.

10. The advisor provides insights into formal report writing for all written material as it is produced. Material must be written as the project progresses and the advisor suggests rewrites or organizational changes to improve coherency and the student's ability in the area.

As indicated above, the organization must not expect a faculty consultant solution to the project problem. The students must be allowed to develop their own solution with guidance as suggested previously.

There should, however, be a solid interface between the advisor and organization liaison personnel. Either one should feel free to contact the other about any questions arising in regard to the project. The organization representative should attend as many of the scheduled weekly meetings at the organizational site as he can. At these meetings, students, advisors, and liaison can discuss any facet of the project including project progress, objectives, related topics, personnel problems and suggested revisions or procedures.

c) Project interaction activities.

Outside of the liaison-faculty-student interaction, there is a very important educational area that will frequently provide new material for projects. It occurs in the project center through student interaction. Everyday conversation turns quite often to discussions of Washington, the crazy agency I work with, the politically oriented conversation I had at the agency today and so on. Thus, students get to know more about the workings of Washington and about other facets of a huge, sprawling Government. Project problems are brought out, and frequently other students have contacts or information that can be helpful. It, in effect, provides agency interaction in a way that sometimes never occurs in the various areas of the government because of a lack of contact.

A second, planned project interaction occurs on a weekly basis and this involves organized presentations to all the project groups, the faculty, and agency representatives. Every project group presents a concise, carefully organized updating on its project. This provides excellent training in communication skills and in preparation of visual aids. Data acquisition difficulties frequently are resolved by other student groups. Feedback from peers and advisors provides additional viewpoints to the project group during the presentation, and the value of communication is inculcated.

Sometimes these sessions are used for presentations and informal discussion not specifically related to the projects. Several Washington insiders from agencies, political ranks, or alumni working in Washington are invited to make short presentations and continue with an informal discussion

Other sessions include presentations in specific information areas for which one or more groups find a need; for example, economics fundamentals from a faculty member or a Washington specialist, or a presentation on technical report writing.

d) Washington scene contributions.

Obviously, one of the important spinoffs of the Washington experience is the opportunity for sightseeing, entertainment, and interaction with other Washington residents. This area provides superb educational experiences and contributes to a more mature, professional project approach and certainly to the sophistication of the student. Sightseeing includes many different types of interesting and educational activities. These include taking in the usual historical sites and museums, more obscure and less publicized points of interest, unlimited research and data sources, and many educational and entertaining trips and tours.

Information about current programs, exhibits and tours is available in local papers and a very fine guidebook was found to be "Going Places With Children" (yes, seriously) which is available in any local bookstore.

Entertainment is varied and includes the best in theatre and concerts (many of them with no admission charge), a tremendous variety of excellent restaurants, and some interesting clubs and bars.

Interactions with other college students and interns, rap sessions, and exchange of information, occur very frequently when the students become involved in other extracurricular activities.

2. Scheduling

The Washington project, even more than other WPI interactive projects, requires a great deal of attention to activity scheduling. The seven-week time frame, within which the project, operates makes it essential that report material be produced from the very first week. Experimentation, by allowing the final work and report preparation to carry over into the next term, indicated that it was a poor procedure. With the student's new term pressures taking precedence, completion of the project does not normally go well - even if the period immediately following the project is a scheduled break period. The procedures used in scheduling and reporting to produce results within the seven-week term, are described below:

Since there is an original proposal prepared before the project group comes to Washington to begin its project, students must consult with agency liaison, faculty and each other to modify this previously formulated proposal if necessary. It is quite common for the project objectives to change between the time the agency originally prepares its statement and the time the actual project work begins. With the new objectives defined, a semi-final list of tasks and suggested procedures for accomplishment are developed and discussed.

The students must then prepare a detailed task chart listing as many individual items required for project accomplishment as can be generated. Time estimates and individual assignments, and a bar graph indicating approximate starting and stopping times are made. Other types of scheduling are certainly possible and PERT charts, showing the network and critical path are fine, but it is essential that complete and serious scheduling be the first order of business.

Firm requirements must be established by the advisors, particularly at the beginning of the project. At the end of the first week, the Introduction and first Appendix of the project's final report should be turned in for review. The Introduction presents the background and need for the project and builds a foundation for it, while Appendix A describes the organization, funding, and objectives of the agency. Although it is possible that this material may have to be modified in the final report, it is important that it be written and reviewed during the first week for several reasons which follow.

a. Students must be made to realize that it is always easier to modify material then to originally create it.
b. The final report starts to form and there is actually some written material in place. This keeps the student from worrying about the trauma of preparing the report in the final weeks of their residence.
c. The faculty has an opportunity early in the project to provide feedback on technical writing skills.
d. The student must clearly communicate the need for, and requirements of, the project, while becoming totally involved.

By the end of the second week the final report outline must be complete. This will eventually become the Table of Contents. With this indication of what must finally be done, and with the first of the written material in place, he can see the report taking form.

Every week some written material is passed into the faculty advisor for his review. The final draft copy comes to the advisor by the end of the fifth week and weaknesses are identified, permitting time for additional analyses.

The final week is spent completing the written report and preparing the oral report for presentation to the sponsoring organization. These oral reports are typically informal in nature and include the use of visual aids.

Records and Meetings

Usually there will be one scheduled meeting with students, faculty and agency liaison at the agency each week. Meetings last from one to two hours. Activities at these meetings include:

a. review of log sheets as a means of bringing the advisors up to date on progress,
b. comparison of progress with PERT and task charts,
c. student request for faculty input on specific topics,
d. review and interpretation of advisor comments on previous week's material,
e. review of suggested work activities for the next week, and
f. informal discussion of project topics and identification of additional sources of information.

Each project group will keep a notebook that contains the following material:

a. weekly log sheets and next week's plans for each student,
b. a list of all contacts made in connection with the project, with agency affiliation and telephone number, and
c. all rough draft material as it is written. (This notebook which is reviewed by the advisor weekly and returned to the project group, gradually becomes the rough draft of the final report.)

A sample of a typical log(weekly report) sheet follows:

FORMAT FOR PERSONAL LOG SHEET:

NAME:

FROM: (DATE) TO: (DATE)

ORGANIZATION

LOG SHEET

DATE	PLACE	TIME	DESCRIPTION OF ACTIVITIES
4/2/75	Org.	1-5:30	Meeting: Topic (Task I) Present: Name, Title (Detailed Minutes p. ___) Substantive Content: 1. 2. 3. Permission was granted to quote or paraphrase.

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3. Final Report Guidelines

Considerable experimentation took place during the center's first year in providing the students with a clear indication of the faculty's expectations with regard to the form and content of the final written report that each project group was required to submit.

"Final Report Guidelines" (contained in the Washington, D.C. Project Center Procedures Manual, given to each student participating in the program) is an attempt to:

1) identify faculty expectations concerned with report content in terms of coherency, organization and analytical depth, and
2) establish a minimum level of acceptability in the student's perception of the art of formal report writing.

The disadvantage of prespecifying the final report format is the distinct possibility of limiting the creativity of the project group in developing a format which would be more directly amenable to the specific project topic being analyzed. For this reason, the "Final Report Guidelines" are prepared in a way that they can be adapted to virtually any educational project effort with a significant analytical content, and the faculty advisors are careful to assure an alternative format proposed by any project group is given equal consideration as an alternative.

Pertinent excerpts from the "Final Report Guidelines" are presented in Appendix B. Below is the Table of Contents specified for all final project reports completed through the Washington, D. C. Project Center. Perusal of the Chapter titles should confirm their adaptability to virtually any educational project that requires an analytical approach.

Letter of Transmittal
Title Sheet
Abstract
Table of Contents
I. Introduction
II. Executive Summary
III. Literature Review (or Background Information)
IV. Methodology (or Procedure)
V. Results
VI. Analysis of Results
VII. Conclusions
VIII. Recommendations
APPENDICES
A. Organizational Structure of Agency

4. Maintaining Academic Standards

Design of an academic program for safeguarding standards can only be accomplished by providing faculty with a wide variety of alternative evaluation methods, not a prespecified definition of standards. Establishing procedures for oral presentations, interim reports, draft reviews, and a format for final report presentation provide the faculty advisors with a range of evaluative techniques and teaching devices that assure him sufficient opportunities to maintain standards.

V. PROGRAM EVALUATION

Achieving Program Objectives

An off-campus project center requires four different groups of participants to mutually support the program. The cooperating agency, the college administration, the students and the faculty share certain mutual objectives, but also have distinct individual expectations. While there is agreement that educational objectives are most important, the success of the program is judged by whether or not the individual expectations of each party are also met.

The Washington Project Center was originally proposed as year-and-a-half, proof-of-concept operation to be followed by one-half year of the program evaluation. The program would achieve a steady-state operational mode beginning with the third year. This report is being prepared at the end of the first year of operation, as such, the major portion of the evaluation is yet to be completed. Therefore this chapter primarily contains a discussion of what must be evaluated after the proof-of-concept stage, rather than actual evaluation results.

Documentation

Data must be gathered so that the program's progress in achieving each objective can be evaluated. The most visible documentation of the project is the final student report. Additional tangible documentation of the project is available in the form of tape-recorded interim and final oral presentations, further use and, possibly, publication of portions of the final written reports, and by follow-up evaluations of the program.

Certain intangibles, such as visibility of the college name, cannot be directly documented; however, that should not prevent such factors from being considered in evaluating the success of the program.

Evaluation of Faculty Development Objectives Achievement

Most of the issues related to achieving the objectives of the participating faculty will be evaluated through a properly constructed questionnaire. All the faculty that have thus far returned from Washington are enthusiastic that participation in the program has greatly expanded their professional experiences. The faculty also feel that the benefits of these experiences far outweigh the disadvantages of the separation from campus. Faculty members typically return from Washington with the renewed vigor and broadened outlook that is typical of a sabbatical leave.

The most frequent mentioned benefits are changes in project advising skills brought about by a full-time effort in advising projects.

The advantages of co-advising projects and improved ability to evaluate.

Evaluation of Administrative and Financial Objectives Achievement

The administrative and financial objectives were posed as a series of nine questions. The answers to these questions provide evaluation as to whether these objectives have been met. The majority of answers will not surface from two or three years.

1. In regard to the implementation of the school's educational objectives, what progress has been made? Preliminary responses by organization liaison and off-campus observers indicate acceptance of the IQP as a valid educational mechanism and a general satisfaction with the output of WPI students. While it is impossible to know if this institute is progressing rapidly enough at this time, the off-campus center has at least given the college the knowledge that it has progressed.

2. Can an intensive effort be made to focus campus attention on interdisciplinary activities at the societal-technological interface?

   The Washington Project Center focused more attention on the IQP than any other single activity at WPI. Participating faculty have been among the most active advisors of on-campus IQP's. The extent of adoption by the rest of the faculty of the co-advising system, final report format guidelines, and other mechanisms will be indicators of how much attention is given to the activities of the off-campus center.

3. Are the faculty able to advise students in an interdisciplinary environment while separated from the campus?

   During the first year of operation, all five faculty members were from engineering departments. Their ability to quide students into disciplinary areas not their own is well documented by the issues addressed in the completed final reports. That is not to say, however, that this guidance was provided painlessly. Many hours of preparatory reading in a variety of subjects are invested in each student contact hour. additionally, the faculty regarded this as an exciting challenging experience.

   In succeeding years, the faculty co-advisors will be a combination of an engineer or physical scientist, and a social scientist or humanities teacher.

4. Are students capable of achieving academic goals without access to on-campus resources?

   It is the consensus of the center's faculty that the vast majority of student work produced at the center exceeded expectations.

5. Are the peer review systems of promotion and tenure capable of recognizing faculty accomplishments in this area?

   Clearly this question cannot be answered at this time, and it will be two to three years before the data is fully available. Since faculty participation in the center requires additional effort, faculty tend to feel that the rewards for participation should be visible shortly. It is not clear that the review systems are capable of functioning within the time frame which seem appropriate to the faculty.

6. Is the impact of the school's new visibility through the program beneficial?

   All public use of an off-campus project center material over the first several years of operation should be clearly documented. These materials include news releases, college promotional material for new student recruiting, material incorporated into funding proposals, and public presentation by faculty, students, or administration dealing with project center operations. Clear documentation of publicity-oriented use of project center material will allow its net worth to the college to be estimated.

7. Can a budgetary process be devised to allow the flexibility required to function, and the accountability required to establish, a separate and distinct operation?

   It can be concluded that a sufficient number of budgetary logistical devices exist for an off-campus center to function. However, the on-site director must be allowed a sufficient level of discretion during the first year of the program to be able to respond to unanticipated cost items. The alternative of on-campus approval prior to all expenditures would cause delays long enough to debilitate the vast majority of the program's functional elements.

8. Can a center exist outside of the normal matrix organizational structure to better respond to interdisciplinary affairs?

   The establishment of a center directed at interdisciplinary projects would serve as proof that the heads of departments consider the goals of the college to be as important as, or even more important than, the goals of each indivudal discipline.

   However, as a result of not being under the jurisdiction of any single department, the center's staff would not have access to administrative support functions without the existence of an office that specifically provides such services to non-departmental functions. Without such support, the logistics of operating an off-campus center would be debilitating. At WPI, such an office, the Projects Office, had been in operation for two years at the start of the program.

   The responsibilities of this Office include:

   1. processing and maintaining the financial records of all expenditures,
   2. assisting the center director with the developmental and follow-up efforts of expanding organization contracts,
   3. coordinating all on-campus functions with center activities, and
   4. coordinating student recruitment and selection.

9. What will be the impact of returning students and faculty on the campus?

   a. Returning Student Input to Campus Environment. In general, this area can only be evaluated subjectively by questioning students, faculty and administration. Tangible results appear in the form of on-campus student presentations and utilization of student reports as case studies.

   b. Returning Faculty Input on to Campus Environment. Faculty development can be evaluated by documenting future faculty endeavors after returning from the Washington experience. Increased faculty capabilities in developing and maintaining off-campus project involvement should be apparent. If faculty development has taken place, then subsequent pay, promotion and tenure considerations of the participants should be above average.

Evaluation of Student Objectives Achievement

The primary student objective is the completion of a degree requirement. In many instances the student's opinion of the Washington experience is governed by the grade evaluation of his performance. Whether or not additional student objectives have been satisfied can be determined from faculty and student questionnaires.

1. More Interesting Projects with Better Logistical Support. The importance that the students attach to this objective and whether it was achieved will best be determined by a student questionnaire. Better logistical support is a motivating criteria for many students.

2. Opportunity for a Concentrated In-Depth Study. The concentrated effort is considered a benefit by many students, however, it also limits flexibility in scheduling other courses which may be infrequently offered. Here again a student questionnaire is the only way to effectively evaluate this area.

3. Pre-Job Experience. The value of this objective becomes most apparent after graduation when the student begins his or her first job. Several points need to be documented; the extent to which it helped in obtaining the first job, use of the faculty advisor and agency liaison as a reference, and the extent to which the experience aided the transition to the first job. This data can only be fully evaluated a year or two after completion of the project, however, many students have already used their Washington Project advisor as a reference.

4. Improved Skills. This area can best be evaluated by the faculty advisors with possible input from the agency liaison. The faculty member has a close association with the student from the project preparation course through the completion of the project. Growth of student skills should be noted by the faculty member since it is a criterion in the grade evaluation. Comparison of work submitted and oral presentations in the preparation course versus the final report presentations can be made relatively easily. These same comparisons should be made with a control group of students not participating in center operations. The student participating in the project center operations may appear to experience a quantum increase in skills and therefore reflect favorably on the program. This may not be borne

out quantitatively since the same growth may take place in on-campus students over the longer time duration of their projects. Student opinion of improved skills should also be evaluated through a questionnaire.

5. The Social Experience of Living and Working in Washington. This is an important criterion. Proper choice of living quarters in terms of location and interior environment will generally insure that this objective is met. It is very easy to obtain student input on this matter. Student reaction thus far has been favorable.

6. Close Faculty Contact. Like most other objectives in this section the primary data available will be gathered through student questionnaires. Faculty should also be contacted on this issue.

Evaluation of Organizational Objectives Achievement

The organizational objectives previously described are the usefulness of the student report, professional satisfaction in participating in the educational process, close contact with faculty, and information obtained through program participation and the possible recruitment of some student participants. The most significant agency evaluation of the program will be their attitude toward participation in future projects and the degree to which they are willing to fund future projects. Clearly the desire to participate in and fund future projects represents the highest level of agency evaluation of the success of past projects.

The method for evaluation of whether each specific agency objective is being met is outlined below.

1. Usefulness of the Student Report. The following documentation is required to evaluate this objective. How was the student report used and was it closely allied to a specific agency mission? Reports done on topics that are not closely allied to a specific agency mission are apt not to be useful. How much time did the liaison devote to the students, and what was the degree of enthusiasm with which this time was granted? The degree of liaison interest is often directly related to the importance of the topic, the amount of agency logistical support provided for the project and the manner in which it was allocated. If the agency balks at committing secretarial time, they are probably evaluating the usefulness of the project. A general evaluation of the usefulness of the project can be obtained by combining writing evaluations by faculty and agency personnel.

2. Professional Satisfaction in Participating in the Educational Process. This is intangible and difficult to assess. Combined written evaluation by the faculty and agency personnel associated with the students, the type of guidance they are given, and the manner in which the agency personnel utilized the students. If the agency personnel consider the students solely as a pool of free labor then this objective is not important to them. The "degree of protection" afforded the students by the agency is a good indicator as to how they rate this objective. This is an important criterion in selecting an agency.

3. Contact with Faculty. Experience in the program has shown that some agencies appear to consider the contact with faculty one of the most important aspects of the program. It may be important to the success of the program that the faculty advisors make an effort to develop strong relationships with the liaison independent of the student project. Written evaluation by faculty and agency personnel can be used to determine whether this objective has been met (or is important).

4. Information Obtained Through Program Participation. This objective only becomes important in some agencies where several successive projects are initiated. Generally, faculty are in a position to determine if the agency is interested in information that is transmitted between agencies through program participation.

5. Whether participation in Washington Project Center operations benefits an organization in recruiting students cannot be evaluated at this time. There are two potential benefits in this area; recruitment of a student who worked on a project with the organization, or recruitment of another WPI student who was not affiliated with an organization's project, but was attracted by the favorable publicity generated by such a project.

Evaluation of Educational Objectives Achievement

The primary evaluation (grading) of student success in fulfilling the educational objectives of the project is the responsibility of the faculty advisors. This evaluation generally considers the broad spectrum of student effort including the final report, oral presentations, meetings with the advisors, and work submitted throughout the project. Student growth and development are also considered. The fact that the center operation develops close student-faculty association tends to make evaluation of the educational objectives a continuous process throughout the project, rather than a phase that is initiated after the final report is submitted.

More and more of the educational objectives of the program are being achieved as experience is gained. All four parties that mutually support the program agree that it is meeting the educational objectives. Some preliminary evaluation of student and agency experiences has been obtained through the use of questionnaire instruments.

VI. FINANCING AN OFF-CAMPUS EDUCATIONAL CENTER

Program Cost

The unit cost of a project conducted at an off-campus project center is obviously higher than that incurred by an on-campus project. The reason for this is that normal operating costs are not decreased when a small number of students leave the campus. That is, if only five percent of the student body are at the center, it is not feasible to reduce on-campus staff such as security, housing, library services, computer services, or student activities. All of the costs associated with the provision of these on-campus functions remain essentially constant, even in steady state, unless a significant proportion of the student body is located off-campus.

This being the case, the incremental cost of the program can be predicted by summing the out-of-pocket costs which are not normally incurred on campus. The net cost of the program can then be determined by subtracting all center-related income sources. Suffice it to say, a substantial amount of income in addition to tuition must be obtained to operate a program similar to WPI's.

It is anticipated that once the program has advanced out of the proof-of-concept phase, these additional funds will be primarily offset by two income sources: one, funds from the organizations cooperating in the program and two, some amount of institutional support above tuition. Cooperating organizations are willing to fund the program if the liaison perceives that his objectives have been met in previous project efforts. It is rare that a liaison has the willingness to allocate funds to the program prior to the execution of at least one project.

Internal support can be justified on several grounds: the enhancement of the undergraduate learning experience, the increased visibility of the institution, and the potential for faculty contact with research funders.

As a guide to the development of a financial plan for the establishment of an off-campus educational center, the following sections present the types of costs typically incurred.

Functional Budget Sheet

As line-item costs vary from institution to institution, it is best to discuss financial expenditures in a way that would be applicable to any educational institution initiating and operating an off-campus center. Tables 1 and 2 present representative functional budget sheets for the start-up year, and for a fourteen-week period in steady-state operation.

TABLE 1. Functional Budget Expenditure Sheet for First Year's Operation of an Off-Campus Center.

LINE ITEM EXPENSE	PERCENT OF TOTAL
1. Salaries - Faculty, Director, Administrator	48
2. Wages - Casual, Undergraduate Students	1
3. Wages - Casual, Secretarial/Clerical	3
(Sub-total, Salary and Wages)	(52)
4. Supplies and Expenses	2
5. Equipment - New and Replacement	1
6. Postage	
7. Telephone	2
8. Meetings and Conferences	2
9. Travel	10
10. Freight and Storage	2
11. Real Estate Expense	29
(Sub-total, Other)	(48)
TOTAL	100%

12. Overhead at institution's rate on direct costs

First Year Operation

A brief explanation of each line-item expense in Table 1 is given below.

1. Salaries - Faculty, Director, Administrator. During the first year's operation, the program director (a member of the faculty) is on-site through the entire course of the center's operation. Preparation for the center opening requires support during the summer months preceeding student arrival. Because the director is jointly responsible for the administration of the program with the Projects Administrator, and for academic co-teaching with a second faculty member, it is appropriate to provide him with some additional increment of renumeration above his normal academic salary. The faculty members participating in the program as co-teachers with the director are reimbursed from the budgets of their respective, on-campus departments. The proportion of time devoted to the center's operation is then paid for as a transfer from the center budget to the department as release time. This method allows the department to maintain its own program through rescheduling and/or the addition of a part-time faculty member as a temporary replacement.

As a guide, the total expenditure under this line item would be the salary expense of approximately two-and-one-third, full-time-equivalent-faculty, and twenty percent of the on-campus Project Administrator's salary.

TABLE 2. Functional Budget Expenditures Sheet for Second Year's Operation of an Off-Campus Center (one semester).

LINE ITEM EXPENSE	PERCENT OF TOTAL
1. Salaries - Faculty, Director, Administrator	53
2. Wages - Casual, Undergraduate Students	1
3. Wages - Casual, Secretarial/Clerical	4
(Sub-total, Salary and Wages	(58)
4. Supplies and Expenses	1
5. Equipment - New and Replacement	1
6. Postage	1
7. Telephone	1
8. Meetings and Conferences	5
9. Travel	11
10. Freight and Storage	0
11. Real Estate Expense	22
(Sub-total, Other	(42)
TOTAL	100%

12. Overhead at institution's rate on direct costs

2. Wages - Casual, Undergraduate Students. Although a negligible expense is incurred, it is useful to include in the budget some funds for employing the students at the center for clerical tasks between or after academic terms. The transport of audio-visual equipment and films, supplies, and the like, are some of the tasks that can be economically performed, and can provide students with a means of defraying some of the added costs of participation in the program.

3. Wages - Casual, Secretarial/Clerical. Secretarial support to the director of the program can be provided by either of two mechanisms. On-campus support by a secretarial pool can be provided through correspondence on work task of major duration when the time lost by communicating long distances is not significant when compared to the duration of the total effort. On-site support can be provided on a part-time basis for the day-to-day preparation of correspondence, lecture handouts, evaluations and filing.

The approximate equivalent of a part-time secretary over a twelve-month period working 20 hours per week should be anticipated.

4. Supplies and Expenses. The majority of supply expenditures are for the acquisition of publications that are required by the faculty and students to successfully work in areas with which their previous experience is relatively brief. Another major expense is the preparation and reproduction of informational packets for all the program participants.

5. Equipment - New and Replacement. Other than minor items such as a tape recorder or hand calculator, equipment expenditures can be kept to a minimum. However, if audio-visual, reproduction or other items are considered desirable, the costs of transportation and maintenance at a site far removed from the campus, should be evaluated, and added to the budget.

6 and 7. Postage and Telephone. Items which are normally trivial in an on-campus budget, such as postage and telephone costs, obviously increase when functions are performed off-campus.

8. Meetings and Conferences. Honoraria for guest speakers and expenses for meetings with alumni or with organizational and government representatives should be budgeted if the program is to allow students and faculty to appreciate the climate in which project problems an being addressed by others. Sparse funding for providing such opportunities would negate one of the major benefits of off-campus project work. On the average, about two such events each month seem reasonable. More would accomplish little, and less does not provide sufficient information in a seven-week period to be useful.

9. Travel. Travel costs are a major budget item, comprised of the following:

a. faculty to and from campus,
b. director travel to and from campus
c. local travel to individual project sites.
d. administrative travel for program development, and
e. faculty cost-of-living allowance.

Costs for the first four items in the list are site and program dependent. The cost-of-living allowance is provided to each faculty member to offset the additional costs associated with relocation that are above and beyond those costs normally incurred by the faculty member.

10. Freight and Storage. The assignment of an on-site director for a full year carries with it the cost of relocating his belongings, or placing them in storage or maintaining them at their original location and renting new ones. The relative cost of each alternative is about the same.

11. Real Estate Expense. Housing for the director, the faculty advisor and the students is obviously a major cost item. Apartment rents for the students average about $220 per student per seven-week term. Rental costs for the faculty and their families average about $425 per month for each faculty member. The per-student cost is based on the anticipation that the program fills the units rented.

12. Overhead. Overhead costs are incurred in the form of on-campus service provided in support of the program. These costs are averaged over all of the institution's functions, and an off-campus center has these services provided to its participants whether or not they can be

fully utilized. As a result, the average overhead rate incurred by the institution must also be applied to off-campus functions.

Second Year Operation

During the second academic year, the Washington, D. C. Project Center is scheduled for two, seven-week terms as opposed to the first year's schedule of all four terms. The remaining two terms' effort are expended on the development of the third year's operation, and these efforts must be accounted for in the second year's budget.

The major differences between the two years is that the director is located on-campus, and two faculty co-advisors are on-site. The cost of relocating the director is eliminated. Orientation of students (3), a start-up cost in the first year, was eliminated as the sense of awareness increased and the uncertainty of the students diminished. The cost of recruiting cooperating organizations is also considerably reduced as the program gains experience.

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(3) During the first year's operation students were transported to Washington for an orientation visit as part of the preparation course.

APPENDIX A

COMPLETED PROJECT SUMMARIES

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: A74 TYPE: IQP

Title:

TECHNOLOGY INDICATORS

Cooperating Organization:

U. S. Department of Commerce

Abstract:

This project, prepared in association with the U.S. Department of Commerce, Washington D.C., explored the hypothesis that the state of technology and its utilization within an industry may be quantified and expressed as a comprehensive scalar through the use of a technology indicator for that industry. The components of such an indicator, given the name descriptors, are selected from amongst those data normally collected by the Federal Government on specific industries. Implementation of the developed methodology in the aircraft, construction machinery, and textile machinery industries indicate that existing government data bases are in large part either not directly applicable, or provide relatively poor proxies for measures of technology.

Library Reference No. JSD-DOC1 No. of Pages: 92

Student	Major	Year
Raymond D. Cibulskis	ME	75
John M. Gerstenlauer	CE	76
Martin J. Kristy	PH	75
James J. O'Neil	CS	75

Faculty Advisor: J. S. Demetry

Faculty Coadvisor: F. C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: A74 TYPE: IQP

Title:

SPACEVISION: A NEW CONCEPT IN EDUCATION

Cooperating Organization:

U. S. Department of Health, Education & Welfare

Abstract:

This project, prepared in association with the National Institute of Education, Washington D.C., focuses on the preparation of chronological narrative and an analysis of the decision sequences surrounding the implementation of the Educational Technology Demonstration (ETD) in the Rocky Mountain Region. In this demonstration, a communications satellite in geosynchronous orbit beamed educational video programming to six Rocky Mountain states. The project researches the roles of such participant agencies as the National Aeronautics and Space Administration, The Department of Health, Education and Welfare, and the Federation of Rocky Mountain States.

Library Reference No. JSD-HEW1 No. of Pages: 41

Student	Major	Year
David A. Eves	CE	76
Glenn Guglietta	LS	76

Faculty Advisor: J. S. Demetry

Faculty Coadvisor: F. C. Lutz

PROJECT REPO[illegible]MARY SHEET
WASHINGTON D. [illegible] PROJECT CENTER
WORCESTER PO[illegible]ECHNIC INSTITUTE

TERM COMPLETED: A74 TYPE: IQP-MQP

Title:

PROGRAM PLANNING FOR EVALUATION

Cooperating Organization:

U.S. Department of Housing and Urban Development

Abstract:

In this project, prepared in association with the Department of Housing and Urban Development in Washington, D. C., the students devised a program planning system that incorporates evaluation feedback loops to allow for constant program monitoring and readjustment of objectives or implementation methods. The practical composition of the loops is discussed and the system is applied to four programs of HUD's Office of Policy Development and Research. The system provides coherence to an otherwise scattered series of program evaluations. It is hoped that the system will allow for more expeditious program evaluation and for improvement of program effects.

Library Reference No. JSD-HUD1 No. of Pages: 199

Student		Major	Year
Noreen Pirog	(IQP)	CE	76
John Aubin	(MQP)	CE	76
Steven Borys	(IQP)	CE	76
David Williams	(IQP)	CE	76

Faculty Advisor: J.S. Demetry

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: A74

TYPE: IQP

Title:

FEASIBILITY OF CONVERSION TO DIRECT COAL COMBUSTION

Cooperating Organization:

National Association of Manufacturers

Abstract:

This project, prepared in association with the National Association of Manufacturers, in Washington, D.C., explores the feasibility of conversion to direct combustion of coal in large industrial and utility installations currently using oil and natural gas. Factors considered include energy demand projections, environmental constraints, security of supply and costs of conversion. A number of policy, legislative, and research recommendations are formulated.

Library Reference No. JSD-NAM1

No. of Pages: 40

Student	Major	Year
Vlassios C. Danos	CE	76
Brian P. Barnoski	CM	76

Faculty Advisor: J.S. Demetry

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: A 74 TYPE: IQP

Title:

MUNICIPAL APPLICATIONS OF CABLE TELEVISION

Cooperating Organization:

Public Technology, Incorporated

Abstract:

This project, prepared in association with Public Technology, Inc., Washington, D.C., explores the applications of cable TV from the viewpoint of a municipality and its officals. Particular emphasis is placed on the public safety, security, and utility meter monitoring potential of cable systems. Feasibility, cost, ownership, and public acceptance are among the factors addressed by the study.

Library Reference No. JSD-PTI1 No. of Pages: 76

Student	Major	Year
James H. Hohorst	CE	76
Thomas A. Colp	CH	75

Faculty Advisor: J.S. Demetry

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: A74 TYPE: IQP

Title:
DISINFECTION: IS CHLORINE STILL THE ANSWER?

Cooperating Organization:
Public Technology, Incorporated

Abstract:

This project, prepared in association with Public Technology, Inc., Washington, D.C., addresses emerging problems connected with the use of chlorine in water and wastewater disinfection. Ozone disinfection, currently thought to be the most feasible alternative to chlorine usage, is explored in the context of these emerging drawbacks of chlorine usage. Conclusions are drawn with respect to the desirability and effectiveness of the two methods for particular applications. The apparent barriers to acceptance of ozonation in the U.S. are explored and discussed.

Library Reference No. JSD-PTI1 No. of Pages: 43

Student	Major	Year
William J. Mullen	CE	76

Faculty Advisor: J.S. Demetry

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: B74 TYPE: IQP

Title:

TECHNOLOGY INDICATORS

Cooperating Organization:

U.S. Department of Commerce

Abstract:

This report, prepared in cooperation with the U.S. Department of Commerce, analyses the effects of production technology in an industry. A method is developed and tested whereby various input technology descriptors; such as, production workers/total work force, are combined into a numerical indicator of the level of technology. A computer program is included.

Library Reference No. CWS-DOC2 No. of Pages: 154

Student	Major	Year
Virginia A. Giordano	MA	75
W. Duncan MacIntosh III	ME	76
Charles F. Moulter	ME	76

Faculty Advisor: C. W. Staples

Faculty Coadvisor: F. C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: B74

TYPE: IQP

Title:

A METHODOLOGICAL APPROACH TO ANALYZE LEGISLATION AFFECTING ENERGY SITING

Cooperating Organization:

National Association of Manufacturers

Abstract:

This report, prepared in association with the National Association of Manufacturers, deals with the factors involved in siting refineries and electric power plants. Areas studied are engineering constraints, environmental problems, economic considerations, legal framework and social cultural effects. A suggested procedure for legislative analysis of related bills is presented.

Library Reference No. CWS-NAM2

No. of Pages: 134

Student	Major	Year
Robert W. Birnberg	BU	75
George J. Hefferon	CH	76
Robert W. Sengstaken Jr.	EE	75
Barry F. Tarr	CS	76

Faculty Advisor: C.W. Staples

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: B74

TYPE: IQP

Title:

A PROCEDURE FOR TECHNOLOGY UTILIZATION

Cooperating Organization:

National Science Foundation

Abstract:

A study of Technology Utilization, prepared in association with the NSF Office of Intergovenmental Science and Research Utilization, in the Solid Waste Management field, establishes the significance of university as a technology delivery mechanism. A model of the delivery of a National Science Foundation Research report to the Worcester County area through WPI is developed and evaluated.

Library Reference No. CWS-RAN2

No. of Pages: 154

Student	Major	Year
John P. Casey	CE	76
Anne L. Madara	MA	76
David A Reid	CE	76

Faculty Advisor: C.W. Staples

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: B74 TYPE: IQP

Title:

ENERGY CONSERVATION LEGISLATION EVALUATION FOR NEW ENGLAND

Cooperating Organization:

New England Congressional Caucus

Abstract:

This report, prepared in association with the New England Congressional Caucus, studies industrial energy conservation legislations, presents an evaluation process with respect to impact on various sectors of New England, and suggests energy related legislative options for New England Congressmen's consideration.

Library Reference No. VWS-NECC No. of Pages: 59

Student	Major	Year
Edward T. Griffin	EE	75
Oliver J. Smith	EE	75

Faculty Advisor: C.W. Staples

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: B74

TYPE: IQP

Title:

WASTEWATER TREATMENT SURVEY

Cooperating Organization:

Public Technology, Incorporated

Abstract:

This report, prepared in association with Public Technology, Incorporated, studies the most important parameters to monitor in the influent, process control, and effluent stages of wastewater treatment, surveys current instrumentation or methodology utilized, and notes problem areas of priority parameters measurement.

Library Reference No. CWS-PTI3

No. of Pages: 52

Student	Major	Year
Barry M. Siff	EC	76

Faculty Advisor: C.W. Staples

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: B74 TYPE: IQP

Title:

REMOTE SENSING AND LOCAL JURISDICTIONS' CAPABILITIES AND NEEDS

Cooperating Organization:

Public Technology, Incorporated

Abstract:

This report, prepared in association with Public Technology Incorporated, analyses the capabilities of satellite remote sensing technology and the needs of local governments for these capabilities.

Library Reference No. CWS-PTI1 No. of Pages: 40

Student	Major	Year
Richard A. Weaver	CE	75

Faculty Advisor: C. W. Staples

Faculty Coadvisor: F. C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: B74 TYPE: IQP

Title:
MARKETING THE NEEDS OF AN IMPROVED FLOWMETER

Cooperating Organization:
Public Technology, Incorporated

Abstract:

This report, prepared in association with Public Technology, Incorporated, is a marketing survey which relates demand to area and city size, and presents flowmeter problems and suggestions for desirable characteristics and marketing options.

Library Reference No. CWS-PTI1 No. of Pages: 28

Student	Major	Year
Alexander Bowers	ME	76

Faculty Advisor: C.W. Staples

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: B74

TYPE: IQP

Title:

INTERMODAL FREIGHT TERMINALS: LABOR AND MANAGEMENT BARRIERS TO IMPLEMENTATION

Cooperating Organization:

Department of Transportation

Abstract:

This report, prepared in cooperation with the U.S. Department of Transportation, studies the four basic methods of freight delivery (rail, motor carriers, air, shipping) and how various methods may be integrated in an intermodal freight terminal. That portion of implementation with respect to management and labor barriers is described in detail.

Library Reference No. CWS-DOT2

No. of Pages: 177

Student	Major	Year
Stephen R. Divoll	MG	76
Christopher M. Ford	EE	76
John C. Forster	CE	76
Paul F. Wheeler	CE	76

Faculty Advisor: C.W. Staples

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: C75 TYPE: IQP

Title:

IMPACT OF ENERGY CONSERVATION ON INDUSTRY

Cooperating Organization:

U.S. Department of Commerce

Abstract:

This report, completed at the U.S. Department of Commerce, analyses a policy option for minimizing the present energy trade deficiency by implementing export tariffs on the basis of energy intensity, rather than economic and political criteria. The analysis is achieved by the development of repeatable methodologies that categorize exports by ratios of the dollar value of energy consumed to the market value of the product. Economic and political implications of the policy are addressed in detail.

Library Reference No. AHH-DOC2 No. of Pages: 244

Student	Major	Year
Perry S. Griffin	MG	76
Mark A. Israel	ME	76

Faculty Advisor: A.H. Hoffman

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: C75 TYPE: IQP

Title:

ANALYSIS OF THE OFFICE OF PRODUCT DEFECT IDENTIFICATION OF THE CONSUMER PRODUCT SAFETY COMMISSION

Cooperating Organization:

Consumer Product Safetry Commission

Abstract:

This report analyses the operation of the Office of Product Defect Identification (OPDI) within the Consumer Product Safety Commission (CPSC) in Washington, D.C. The analysis utilizes interviews and quantitative data from the past files of OPDI cases. Conclusions and recommendations are presented which could improve the present operation of the OPDI and strengthen the CPSC in its product safety mission.

Library Reference No. AHH-CPSC No. of Pages: 191

Student	Major	Year
Thomas W. Stowe	ME	76
John J. Moreney	EE	76
Richard A. Escolas	ME	76

Faculty Advisor: A.H. Hoffman

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: C75

TYPE: MQP

Title:

WATER QUALITY MEASUREMENT

Cooperating Organization:

Council on Environmental Quality

Abstract:

This project, prepared at the Council on Environmental Quality in the Executive Office of the President, develops a methodology for critically evaluating water-quality interpretive techniques. Two applications of methodology are presente[illegible]d a comparative analysis of techniques is also shown. The st[illegible]dentifiies alternative display techniques for various user grou[illegible]cognizing the limittations associated with each.

Library Reference No. FCL-CEQ1

No. of Pages: 249

Student	Major	Year
Paul Carubia	Env.Sci.	75
William Boothe	CE	75

Faculty Advisor: F.C. Lutz

Faculty Coadvisor: A.H. Hoffman

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: C75 TYPE: IQP

Title:

ENERGY AND THE COASTAL ZONE: A METHODOLOGICAL FRAMEWORK FOR SITING OIL REFINERIES AND OTHER ENERGY RELATED FACILITIES

Cooperating Organization:

Council on Environmental Quality

Abstract:

This report (prepared at the Council on Environmental Quality in the Executive Office of the President) develops a methodological framework for siting-energy related facilities in the coastal zone using oil refineries as an example. An identification of the characteristics and needs of an oil refinery, a study of the effects experienced from oil developments in Louisiana, and study of oil refinery siting controversies in New England, and the consideration of land-use controversies in the coastal zone serves as the basis for this methodology.

Library Reference No. AHH-CEQ2 No. of Pages: 233

Student	Major	Year
Robert D. Jamieson, Jr.	CH	75
Morris L. Weisman	PH	75
Mario R. Wunderlich	MG	76

Faculty Advisor: A.H. Hoffman

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: C75

TYPE: IQP

Title:

THE MAYOR'S COMMAND CENTER ITS ROLE NOW AND DURING THE BICENTNEEIAL

Cooperating Organization:

D. C. Office of Civil Defense

Abstract:

This project analyzes the present capabilities of the Mayor's Command Center/District of Columbia Office of Civil Defense. It determines how the Mayor's Command Center (MCC) can utlize these capabilities during the 1976 Bicentennial Celebration in Washington, D. C. A proposal for a Bicentennial Information Center is also presented, and the involvement of the MCC in this Center is analyzed.

Library Reference No. AHH-BCCD

No. of Pages: 211

Student	Major	Year
John W. Diachenko	LS	76
Robert A. Hart	EE	75

Faculty Advisor: A. H. Hoffman

Faculty Coadvisor: F. C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: C75

TYPE: IQP

Title:

ORE QUALITY/PRICE RELATIONSHIPS IN THE ALUMINUM AND IRON INDUSTRIES

Cooperating Organization:

National Association of Manufacturers

Abstract:

This report, prepared at the National Association of Manufacturers Offices in Washington D.C., relates the quality of ore to the cost of the product in the aluminum and iron industries. It documents the energy usage in the mining and processing of aluminum and iron ores. The economic feasibility of alternate production processes are discussed, particularly with reference to using domestic rather than imported ores.

Library Reference No. AHH-NAM3

No. of Pages: 219

Student	Major	Year
Wayne C. Elliot	CE	75
Carey Lazerow	CS	76

Faculty Advisor: A. H. Hoffman

Faculty Coadvisor: F. C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: D75 TYPE: IQP

Title:
THE IMPACT OF UNLEADED GASOLINE PRODUCTION
ON THE PETROCHEMICAL INDUSTRY

Cooperating Organization:
U.S. Department of Commerce

Abstract:

In this report, an evaluation of the impacts of unleaded versus leaded gasoline production on the domestic petrochemical industry is made for the U.S. Department of Commerce in Washington, D.C. Scenarios for projected Naptha-400 degree supplies and demands have been based on high-versus low-fuel economy. These olefin supplies and demands are the bases for an evaluation of impacts. Impacts on employment, on the U.S. balance of trade in petrochemicals, and on the GNP are predicted to the year 1985.

Library Reference No. SDW-DOC4 No. of Pages: 175

Student	Major	Year
Charles Lauzon	CM	76
Edward J. Fasulo Jr.	CM	76

Faculty Advisor: S.D. Weinrich

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: D75

TYPE: IQP

Title:

THE RESPONSE CAPACITY OF THE MAYOR'S COMMAND CENTER DURING THE BICENTENNIAL

Cooperating Organization:

D. C. Office of Civil Defense

Abstract:

The Mayor's Command Center, the communication network of the District of Columbia/Office of Civil Defense (DC/OCD), constantly monitors all emergency situations that occur in the District. This report is an analysis of the response capacity of the DC/OCD during the Bicentennial Celebration based on a five-year summary of previous emergency situations. The analysis is necessary due primarily to the large increase of people coming to D.C. in 1976, and the resultant expansion of MCC responsibilities.

Library Reference No. SDW-OCD4

No. of Pages: 154

Student	Major	Year
Sidney M. Formal	CE	76
Thomas P. May	EE	76

Faculty Advisor: S.D. Weinrich

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: D75

TYPE: IQP

Title:

SPACE HEATER SAVETY

Cooperating Organization:

Consumer Product Safety Commission

Abstract:

This project is prepared in association with Consumer Product Safety Commission, an organization which concerns itself with products which present an unreasonable risk of injury to the consumer. The project concerns gas space heaters and the hazards they present to the public. Injury data is analyzed and accident prevention techniques are investigated.

Library Reference No. SDW-CPSC

No. of Pages: 151

Student	Major	Year
Michael Menesale	ME	76
Joseph Martowski	EE	76

Faculty Advisor: S.D. Weinrich

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: D75 TYPE: IQP

Title:

AN HISTORICAL ANALYSIS OF U. S. ENERGY POLICIES

Cooperating Organization:

Institute of Electrical And Electronic Engineers

Abstract:

This report, prepared in conjunction with the Washington, D.C. Office of the Institute of Electrical and Electronic Engineers, is entitled An Historical Analysis of U.S. Energy Policies. The energy crisis of the 1970's, characterized by a spiraling cost of energy, in part, resulted from past energy policy decisions. The report uses history as a guide to analyze specific energy issues and examines impacts of policy decisions. From this analysis, viable courses of action are projected for the Nation's energy future.

Library Reference No. SDW-IEEE4 No. of Pages: 286

Student	Major	Year
John C. Mangiagli, Jr.	ME	76
Brian Young	CM	76
Charles Nienburg	CS	76
John Manning	EE	76

Faculty Advisor: S.D. Weinrich

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: D75 TYPE: IQP

Title:

THE IMPACT OF ENVIRONMENTAL CONSTRAINTS ON THE PRIMARY COPPER INDUSTRY

Cooperating Organization:

National Association of Manufacturers

Abstract:

This study, completed at the Washington D.C. offices of the National Association of Manufacturers, analyses the impact of recently enacted environmental regulations upon the domestic primary copper industry, from mining through refining. Costs associated with compliance for air, water, and solid waste pollution regulations are calculated. The social, political, economic and market impacts of these additional costs are assessed. This report may be used by NAM in Congressional oversight hearings and will provide the members of NAM with general information concerning the consequences of implementing pollution controls.

Library Reference No. SDW-NAM4 No. of Pages: 173

Student	Major	Year
Thomas J. McAloon	CE	76
Raymond J. Robeym	CM	76
Paul Grogan	CE	76

Faculty Advisor: S.D. Weinrich

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: D75 TYPE: IQP

Title:

TECHNOLOGY TRANSFER AND UTILIZATION OF ENVIRONMENTAL MODELS

Cooperating Organization:

National Science Foundation

Abstract:

This project was done in association with the NSF's office of Intergovernmental Science and Research Utilization. A research study sponsored by NSF is tested for possible application of results, and a general plan for the transfer of technology embodied within the study is prepared. The project concerns a land use management and environmental planning study, first performed at Harvard University. The feasibility and techniques for utilizing this research are evaluated and compared to other land-use planning methods.

Library Reference No. SDW-NSF4 No. of Pages: 125

Student	Major	Year
Daniel Garfi	CS	76
Thomas E. Vaughn	MG	76

Faculty Advisor: S.D. Weinrich

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: D75

TYPE: IOP

Title:

INVESTIGATION OF THE USE OF CONSTRUCTION MANAGEMENT AT THE STATE AND LOCAL LEVELS OF GOVERNMENT

Cooperating Organization:
Public Technology, Incorported

Abstract:

This report, prepared in the Office of Public Technology, Inc., surveys selected state and local officials to determine the extent of the use of construction management techniques at the state, local levels of government. The construction management techniques, the results of the survey, and factors determining the use of construction management at state and local levels of government are discussed and evaluated.

Library Reference No. SDW-PTI4

No. of Pages: 80

Student	Major	Year
H. Warren Fairbanks III	CE	76
Kevin Hastings	CE	76

Faculty Advisor: S.D. Weinrich

Faculty Coadvisor: F.C. Lutz

PROJECT REPORT SUMMARY SHEET
WASHINGTON D. C. PROJECT CENTER
WORCESTER POLYTECHNIC INSTITUTE

TERM COMPLETED: D75

TYPE: IQP

Title:

A PLAN FOR THE ASSESSMENT OF ATTITUDES REGARDING ROAD PRICING POLICIES

Cooperating Organization:

U.S. Department of Transportation, Federal Highway Administration

Abstract:

This report was prepared for the Office of Research of the Federal Highway Administration. It presents a plan for the assessment of attitudes (public, employer and government officials) regarding road pricing policies. Road pricing is one mechanism for dealing with peak period congestion in an urban road system. This report describes how one of three needed surveys was developed and how its results will be analyzed. Suggestions for an appropriate administrative procedure have been included.

Library Reference No. SDW-DOT4

No. of Pages: 140

Student	Major	Year
John Griffiths III	CE	76

Faculty Advisor: S.D. Weinrich

Faculty Coadvisor: F.C. Lutz

APPENDIX B

FINAL REPORT GUIDELINES

Letter of Transmittal:

(Business letter format, written to the agency liaison)

Must contain:

- Submittal statement, report title
- Copies of the report are simultaneously being submitted to the faculty advisors for evaluation
- Upon faculty review, the original will be catalogued in the Gordon Library of Worcester Polytechnic Institute.

Should contain:

- Complementary statement

Title Sheet

(Refer to Exhibit B-1)

Abstract:

Must be 80 words or less, single-spaced, contain name of organization

- e.g., This report, prepared in the offices of the ______

  ____________________, . . .
- One of the last sections to be done.

Table of Contents

Do this last. This will be developed from the final report outline which was originally prepared during the second week of the project.

I. Introduction

Must contain:

- "This report was prepared by members of Worcester Polytechnic Institute's Washington D. C. Project Center. The relationship of the Center to the (name of organization) and the relevance of the topic to the (name of organization) are presented in Appendix A."
- A section on the significance of the subject matter
- Project scope
  - (In general terms, tell the reader what he is about to read)

Note: Most topics require that the reader be given some background to understand the project scope. If so, insert a section on General Background.

II. Executive Summary (one of the last to be written)

This section of the report must stand by itself, and present a thorough synopsis of the major findings. (In some cases, an opening statement would allow an exception: "This chapter, when combined with Chapter I, provides an inclusive executive summary of the subject matter treated in this report").

TITLE SHEET:

Report Submitted to:

Dr. Francis C. Lutz, Director

and

Faculty CoAdvisors

of the

Washington D.C. Project Center
Worcester Polytechnic Institute

by

____(typed names)____ ____(lines and signatures)____

__________ __________

__________ __________

In Cooperation with:

____(names and titles of agency liaison)____

____

____(name of Agency & Division)____

REPORT TITLE IN ALL CAPITAL LETTERS

DATE

This project report is submitted in partial fulfillment of the degree requirements of Worcester Polytechnic Institute. The views and opinions expressed herein are those of the authors and do not necessarily reflect the positions or opinions of ___(the Agency name)__ or Worcester Polytechnic Institute.

This report is the product of an educational program, and is intended to serve as partial documentation for the evaluation of academic achievement. The report should not be construed as a working document by the reader.

Exhibit B-1. Final Report Title Sheet

Letter of Transmittal:

(Business letter format, written to the agency liaison)

Must contain:

- Submittal statement, report title
- Copies of the report are simultaneously being submitted to the faculty advisors for evaluation
- Upon faculty review, the original will be catalogued in the Gordon Library of Worcester Polytechnic Institute.

Should contain:

- Complementary statement

Title Sheet

(Refer to Exhibit B-1)

Abstract:

Must be 80 words or less, single-spaced, contain name of organization

- e.g., This report, prepared in the offices of the______ ________________________________, . . .
- One of the last sections to be done.

Table of Contents

Do this last. This will be developed from the final report outline which was originally prepared during the second week of the project.

I. Introduction

Must contain:

- "This report was prepared by members of Worcester Polytechnic Institute's Washington D. C. Project Center. The relationship of the Center to the (name of organization) and the relevance of the topic to the (name of organization) are presented in Appendix A."
- A section on the significance of the subject matter
- Project scope
  (In general terms, tell the reader what he is about to read)

Note: Most topics require that the reader be given some background to understand the project scope. If so, insert a section on General Background.

II. Executive Summary (one of the last to be written)

This section of the report must stand by itself, and present a thorough synopsis of the major findings. (In some cases, an opening statement would allow an exception: "This chapter, when combined with Chapter I, provides an inclusive executive summary of the subject matter treated in this report").

While the format for Chapter II will vary with each report, the following suggestions as to content may prove helpful:

Introduction
Background
Present Situation
Projections
Constraints
Alternatives
Comparison of Alternatives
Results (or Recommendations of Conclusions)

Executive Summaries are written for people who are responsible for being familiar with many reports just like yours, everyday; of necessity, therefore it must be right to the point.

III. Literature Review (or Background Information)

Usually, a project topic will deal with several areas of knowledge. Under a subheading for each of these areas, present a review of the pertinent information that has already been published.

IV. Methodology (or Procedure)

This is one of the most important chapters in the report.

It must present the methods of analysis employed in such a way that the reader can repeat the procedure with different data. It is a general conceptual flowchart of the problem-solving approach. As an example, this Chapter would show how calculations are performed, without actually using data to perform the calculations.

V. Results

Present the application of the first phase of the methodology to the output of Chapter V, to develop the recommendations and conclusions of the report. That is, now that you have the results, what is significant about them? What do they mean?

VI. Analysis of Results

Present the application of the second phase of the methodology to the output of Chapter V, to develop the recommendations and conclusions of the report. That is, now that you have the results, what is significant about them? What do they mean?

VII. Conclusions

The final decisions, thoughts and precise results that have developed as a result of the project.

VIII. Recommendations

As a result of the project there may be suggested actions, implementation or additional studies that are necessary.

Both VII and VIII should present terse, concise statements.

Appendix A. Organizational Information

This Appendix should include a general background statement on the history and development of the organization, recent budgetary trends, how and by whom its policy is set, and specific statements of its current policies, goals, and objectives.

The original letter from the organization, identifying the topic, should be shown as an Exhibit.

The final section should describe how your project topic is related to the organization's mission, the positions and responsibilities of the people working with you in the organization (show an organization chart), and how the project topic's results would affect components of the organization. (Note: These components are probably very good data sources)